

NONELECTRONIC PARTS RELIABILITY DATA

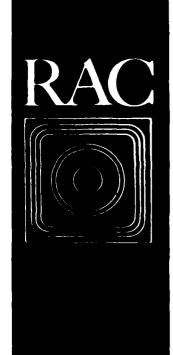




SUMMER 1981



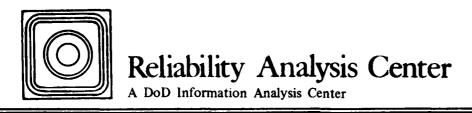
THE RELIABILITY ANALYSIS CENTER IS A DOD INFORMATION ANALYSIS CENTER



。 经基础的 经经验的 医电子

THE INFORMATION AND DATA CONTAINED HEREIN HAVE BEEN COMPILED FROM GOVERNMENT AND NONGOVERNMENT TECHNICAL REPORTS AND FROM MATERIAL SUPPLIED BY VARIOUS MANUFACTURERS AND ARE INTENDED TO BE USED FOR REFERENCE PURPOSES. NEITHER THE UNITED STATES GOVERNMENT NOR IIT RESEARCH INSTITUTE WARRANT THE ACCURACY OF THIS INFORMATION AND DATA. THE USER IS FURTHER CAUTIONED THAT THE DATA CONTAINED HEREIN MAY NOT BE USED IN LIEU OF OTHER CONTRACTUALLY CITED REFERENCES AND SPECIFICATIONS,

PUBLICATION OF THIS INFORMATION IS NOT AN EXPRESSION OF THE OPINION OF THE UNITED STATES GOVERNMENT OR OF IIT RESEARCH INSTITUTE AS TO THE QUALITY OR DURABILITY OF ANY PRODUCT MENTIONED HEREIN AND ANY USE FOR ADVERTISING OR PROMOTIONAL PURPOSES OF THIS INFORMATION IN CONJUNCTION WITH THE NAME OF THE UNITED STATES GOVERNMENT OR IIT RESEARCH INSTITUTE WITHOUT WRITTEN PERMISSION IS EXPRESSLY PROHIBITED.



NONELECTRONIC PARTS RELIABILITY DATA

Prepared by:

Robert G. Arno
IIT Research Institute

Under Contract to:

Rome Air Development Center Griffiss AFB, NY 13441

Ordering No. NPRD-2

SELECTE DEC 10 1981

Approved for Public Release, Distribution Unlimited

The RELIABILITY ANALYSIS CENTER is a DoD Information Analysis Center, operated by IIT Research Institute under contract to the Rome Air Development Center, AFSC.

The Reliability Analysis Center (RAC) is a Department of Defense Information Analysis Center sponsored by the Defense Logistics Agency, managed by the Rome Air Development Center (RADC), and operated at RADC by IIT Research Institute (IITRI). RAC is charged with the collection, analysis and dissemination of reliability information pertaining to parts used in electronic systems. The present scope includes integrated circuits, hybrids, discrete transistors and diodes, microwave devices, optoelectronics, and selected nonelectronic parts employed in military, space and commercial applications.

In addition, a System/Equipment Reliability Corporate Memory (RCM) is also operating under the auspices of the RAC and serves as the focal point for the collection and analysis of all reliability-related information and data on operating and planned military systems and equipment.

Data are collected on a continuous basis from a broad range of sources including testing laboratories, device and equipment manufacturers, government laboratories, and equipment users, both government and nongovernment. Automatic distribution lists, voluntary data submittal, and field failure reporting systems supplement an intensive data solicitation program.

Reliability data documents covering most of the device types mentioned above are available annually from RAC. Also, RAC provides reliability consulting and technical and bibliographic inquiry services which are fully discussed at the end of this document.

REQUESTS FOR TECHNICAL ASSISTANCE AND INFORMATION ON AVAILABLE RAC SERVICES AND PUBLICATIONS MAY BE DIRECTED TO:

Charles E. Ehrenfried Reliability Analysis Center Rome Air Development Center (RBRAC) Griffiss Air Force Base, NY 13441 Telephone: 315/330-4151

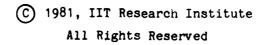
Autovon: 587-4151

ALL OTHER REQUESTS SHOULD BE DIRECTED TO:

Rome Air Development Center RBE/Charles F. Bough Griffiss Air Force Base, NY 13441

Telephone: 315/330-4920

Autovon: 587-4920



SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM		
1. REPORT NUMBER PRD-2 2. GOVT ACCESSION NO AD-A108	4 7		
A. TITLE (end Substite) Nonelectronic Parts Reliability Data - 2	S. TYPE OF REPORT & PERIOD COVERED N/A		
7. Authox(*) Robert G. Arno	8. CONTRACT OR GRANT NUMBER F30602-78-C-0281		
Reliability Analysis Center (RBRAC) Rome Air Development Center Griffiss Air Force Base, New York 13441	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS		
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE Summer 1981		
Rome Air Nevelopment Center Griffiss Air Force Base, New York 13441	13. NUMBER OF PAGES		
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15 SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION DOWNGRADING		
Approved for public release; distribution unlimit Available from RAC or NTIS. 7. DISTRIBUTION STATEMENT (of the abscract entered in Block 20, 11 different from the abscract			
This is the second in a series of publications de parts reliability and supersedes NPRD-1, dated 19			
- · · · · · · · · · · · · · · · · · · ·	es and Mechanisms anical Component		
This report, organized in four major section information based on field operation, dormant stathan 250 major nonelectronic part types. The four Detailed Data, Application Data, and Failure Mode device type contains reliability information in roperational environments.	s, presents reliability te and test data for more r sections are Generic Data, s and Mechanisms. Each		

DD 1 JAN 73 1473 EDITION OF T NOV 65 15 DESOLETE

4.8944

UNCLASSIFIED

ECURITY CLASSIFICATION OF THIS PAGE(When Date Entered)	
	1
	- 1
	1
	1
	}
	1
]
	į
	ł
	1
	1
	1
	1
	ļ
	ì
	ŀ
	ĺ
	1
	!
	1

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIT PAGE (When Date Entered)

PREFACE

This is the second edition of a series of data publications dealing with nonelectronic reliability at the part level. NPRD-2 updates NPRD-1 by expanding the scope and quality of data.

The data presented in these reliability publications are intended to compliment such documents as MIL-HDBK-217 and MIL-STD-883. The user is cautioned, however, that the data contained herein may not be used in lieu of contractually cited references. It should also be noted that the data contained in this document is failure data, not part replacement data. Only verified failures were used in the calculations of the failure rates.

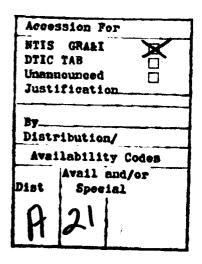




TABLE OF CONTENTS

INTRODUCTIO	N	Page 1
SECTION 1:	NONELECTRONIC GENERIC FAILURE RATES	3
	Definitions of Terms	5
	Index for Generic Failure Rates	10
	Generic Failure Rate Tables	21
SECTION 2:	NONELECTRONIC PARTS DETAILED DATA	117
	Nonelectronic Parts Detailed Data	119
	Index for Detailed Data	121
	Detailed Data Tables	125
SECTION 3:	NONELECTRONIC PARTS DATA FROM COMMERCIAL EQUIPMENT APPLICATIONS	209
	Nonelectronic Parts Data From Commercial Equipment Applications	211
	Index for Commercial Equipment Application Data	213
	Commercial Equipment Application Data Tables	215
SECTION 4:	FAILURE MODES AND MECHANISMS	229
	Operational Failure Modes and Mechanisms	231
	Batteries	231
	Lead-Acid	231
	Nickel-Cadmium	232
	Bearings	233
	Circuit Breakers	234
	Connectors	234
	Coolant Hose	235
	Electron Tubes	236
	Fuses	236

TABLE OF CONTENTS (Cont'd)

		Page
SECTION 4:	FAILURE MODES AND MECHANISMS (Cont'd)	
	Gaskets and Seals	237
	Gyroscope	238
	IC Sockets	239
	Motors	241
	Printed Circuit Board	241
	Pumps	243
	Hydraulic	243
	Pneumatic	244
	Quick Disconnect Couplings	244
	Relays	245
	Armature	245
	Reed	247
	Solder Connections	248
	Switches	249
	Valves	250
	Dormant Failure Modes and Mechanisms	252
	Bearings	252
	Connectors, General	252
	Clutches	252
	Gyros	252
	Magnetrons	253
	DC Motors	253
	Relays, Latching	253
	Relays, Nonlatching	253
	Seals	253
	Switches, Sensitive	254
	Transformer	254
	Part Failure Mode Distribution	255
APPENDIX:	ADDITIONAL RAC SERVICES	259

INTRODUCTION

This nonelectronic reliability data publication provides failure rate and failure mode information for mechanical, electromechanical, electrical, pneumatic, hydraulic and rotating parts. The data utilized in the development of this publication were collected by the RAC and represent equipment level experience under field conditions in military, industrial and commercial applications.

It has been necessary to accept the assumption that the failures of nonelectronic parts follow the exponential distribution; that is, such parts display a constant failure rate. This assumption is necessary due to the virtual absence of data containing individual times or cycles to failure.

Section 1 of this publication provides summarized generic part level failure rates. Section 2 consists of detailed entries by part type and environmental application in unsummarized form. In Section 3, failure rates for parts unique to or frequently used in computer peripherals, point of sale equipment, and test instruments are tabulated. Section 4 presents the distribution of failure modes for a number of major nonelectronic part families.

NONELECTRONIC PARTS RELIABILITY DATA

SECTION 1

NONELECTRONIC GENERIC FAILURE RATES

Section 1

DEFINITIONS OF TERMS

This section presents summaries of field reliability experience for nonelectronic parts. The summaries are presented in alphabetical order by major family classes and alphabetically by type within each family class.

A careful reading of the description of the presentation format and entry codes employed will aid the user of this publication. The circled numbers shown in the tabulation form below are referenced to the explanatory text which follows.

PARE (1445) (1)

				FAILURE RATE	/10 HOURS				
FNVIRONMEN	AFFEE	CATION	î	401 UPFER SINGLE-SIDEO	60% CONFIDE	CE INTERVAL	NUMBER OF	MCIMBE R	OPERATING HOURS
	HIL.	COML .		CONFIDENCE	LOWER	UPPER	RECORDS	FAILED	(10 ^K)
	j		_				_		
(3)	(4 1	()	(5)	6)	8	9	10
((1							i :	

(1) PART CLASS

A major family of parts having or providing the same function.

(2) TYPE:

The identification of the part type.

(3) ENVIRONMENT:

The coded entries are as follows:

DOR - Dormant

The state wherein a component or equipment is connected to a system in the normal operational configuration and experiences below normal and/or periodic operational stresses and environmental stresses. The system may be in a dormant state for prolonged periods (up to five years or more) before being used in a mission.

DEFINITION OF TERMS (Cont'd)

SAT - Satellite

Earth orbital, approaches benign conditions without access for maintenance. Vehicle neither under powered flight nor in atmosphere re-entry.

GRF - Ground Fixed

Conditions less than ideal to include installation in permanent racks with adequate cooling air, maintenance by military personnel and possible installation in unheated buildings.

GRM - Ground Mobile

Conditions more severe than GRF, mostly for vibration and shock. Cooling air supply may also be more limited, and maintenance less uniform.

A - Airborne

The most generalized aircraft conditions.

AI - Airborne Inhabited

General conditions in inhabited areas without environmental extremes.

AIT - Airborne Inhabited Transport

Conditions in inhabited areas of subsonic aircraft such as transport, cargo, heavy bomber, and patrol.

AIF - Airborne Inhabited Fighter

The conditions to be found in the cockpit area of fighters and interceptors.

DEFINITIONS OF TERMS (Cont'd)

AU - Airborne Uninhabited

	areas as cargo storage areas, wing
	and tail installations where ex-
	treme pressure, temperature and

vibration cycling exist; also, may be aggravated by contamination from oil, hydraulic fluid and engine

General conditions typical of such

exhaust.

AUT - Airborne Uninhabited Transport Conditions in uninhabited areas of

subsonic aircraft such as transport,

cargo, heavy bomber, and patrol.

AUF - Airborne Uninhabited Fighter Conditions in uninhabited areas of

fighters and interceptors.

HEL - Helicopter Conditions most severe for vibra-

tion, temperature and humidity.

SHS - Ship Sheltered Surface conditions similar to GRF

but subject to occasional high

shock and vibration.

SHU - Ship Unsheltered Normal surface shipboard con-

ditions but with repetitive high

levels of shock and vibration.

SUB - Submarine Conditions normal to operation

aboard a submerged vessel. Tem-

perature and humidity controlled.

DEFINITIONS OF TERMS (Cont'd)

MIS - Missile Launch

Severe conditions of noise, vibration and other environments related to missile launch, and space vehicle boost into orbit, vehicle re-entry and landing by parachute. Conditions may also apply to installation near main rocket engines during launch operations.

(4) APPLICATION:

MIL. (Military)

Data resulting from a military or satellite application.

COML. (Commercial)

Data resulting from a commercial or industrial application.

N/A

Not applicable. The nature of the hardware application is unknown.

3 λ

The maximum likelihood estimator when the exponential distribution is assumed.

6 60% UPPER SINGLE-SIDED CONFIDENCE

The 60% upper single-sided confidence limit estimate of the failure rate, computed from the Chi-square distribution, is provided for those entries for which zero failures have been recorded.

DEFINITION OF TERMS (Cont'd)

7 60% CONFIDENCE INTERVAL, LOWER AND UPPER:

The lower and upper limits of the 60% confidence interval about $\hat{\lambda}$ computed from the Chi-square distribution.

(8) NUMBER OF RECORDS:

The number of records merged to provide the failure rate information. The merged records represent only those accepted by a test statistic based on the F-distribution at the 5% level.

9 NUMBER FAILED:

The total number of failures observed in the merged records.

10 OPERATING HOURS (x106):

The total hours at the part level. Derived by multiplying the part population by the equipment hours of operation observed during the period covered by each record. An asterisk (*) in the $\hat{\lambda}$ column indicates that, for this entry, the failure rate information is given in terms of per 10^6 cycles and the total operating hours in the last column should be read as cycles x 10^6 .

INDEX FOR GENERIC FAILURE RATES

	Page
Accelerometer	21
Angular	21
General	21
Linear	21
Pendulum	22
Accumulator	22
General	22
Hydraulic	23
Actuator	23
Explosive	23
General	24
Hydraulic	24
Linear	25
Rotary	25
Battery	26
Lead Acid	26
Mercury	26
Nickel Cadmium	26
Non-Rechargeable	27
Rechargeable	27
Bearing	28
Ball	28
Bushing	28
General	29
Needle	29
Roller	30
Spherical	30

		Page
Bello	ows	31
	Diaphragm Burst	31
	Explosive	31
	General	31
Brake	e	32
	General	32
	Magnetic	32
Brush	h	33
	Electric	33
Circu	uit Board	33
	Plated Through Holes	33
	Printed Circuit Board	34
	Single Layer	34
	Multilayer	34
	Terminal	34
Circu	uit Protection Device	35
	Fuse	35
	Fuse Holder	35
	General	36
	Molded Case Circuit Breaker	36
	Power Switch, Circuit Breaker	37
	Spark Gap, Surge Protection	37
	Undervoltage	37
Comp	pressor	38
	Air	38
	General	38

	Page
Connection	39
Solder Connection, General	39
Solder, Hand Lap	39
Solder, Wave	39
Wirewrap	39
Connector	40
Circular	40
Coaxial	40
General	41
Phone	41
Pin	42
Power	42
Printed Circuit Board	43
Radio Frequency	43
Rectangular	44
Test Jack	44
Controls and Instruments	45
Air Pressure Gauge	45
Altimeter	45
Ammeter	46
Compass	46
Indicator	47
Magentic Sensing	47
Rate of Flow Instrument	48
Tachometer	48

	Page
Emergency Light	48
General	48
Fan	49
Axial	49
Centrifugal	49
General	50
Filter	50
Fluid	50
Gas	51
General	51
Gasket and Seal	52
Gasket, Shielding, RFI	52
General	52
O-Ring	53
Packing	53
Generator	54
AC	54
DC	54
Diesel Engine	54
Gas Engine	55
General	55
Hot Gas	55
Motor/Generator	56
Turbine/Generator	56

	Page
Gyroscope	56
Directional	57
General	57
Rate Integrating	58
Heater	58
Electric, General	58
Electric, Space	59
General	59
Heat Exchanger	60
General	60
Hose	60
Fittings, General	60
Hydraulic	61
Lamp	61
Incandescent	61
LED	62
Neon	62
Manifold	62
General	62
Mechanical Device	63
Clutch	63
Coupling	63
Gear	63

	Page
Mechanical Device (Cont'd)	
Gear Assembly	64
Gear Shaft	64
Joy Stick Assembly	64
Mechanism, Power Transmittal	65
Speed Drive	65
Spring	66
Miscellaneous	66
Coil, Cooling-Chilled Water	66
Engine	66
RF Cable Assembly	67
Safe & Arm Device	67
Motor	67
Fractional H. P.	67
Full H. P.	68
General, A. C.	68
General, D. C.	69
Induction	69
PM	70
Sensor	70
Solenoid	70
Step	71
Torque	71
Pump	71
Boiler Feed	71
Centrifugal	72
Coolant	72

	Page
Pump (Cont'd)	
Electric Motor Driven	72
Engine Driven	73
Fixed Displacement	73
Fuel	74
Geroter	74
Hydraulic	75
Hydraulic Motor Driven	75
Impeller	76
Oil	76
Turbine Driven	77
Vacuum	77
Variable Displacement	77
Water	78
Regulator	. 78
Fuel	78
General	78
Oxygen Demand	79
Pressure	79
Tension	79
Thermostat	80
Voltage	80
Relay	81
Armature	81
Coaxial	81
Crystal Can	82

	Page
Relay (Cont'd)	
Current Sensitive	82
General	83
High Voltage	83
Latching	84
Motor Driven	84
Power	85
Reed	85
Thermal	86
Time Delay	86
Rotary Joint	87
Microwave	87
Sensor	87
General	87
Shock Absorber	88
General	88
General, Mount	88
Isolator	89
Slip Ring Assembly	89
General	89
Socket	90
Dual-In-Line (Per Pin)	90
High Power Tube	90
Lamp	90
Relay	90

	Page
Solenoid	91
General	91
Sprinkler Head	91
General	91
Switch	92
Centrifugal	92
Coaxial	92
Dual-In-Line (DIP)	92
Flow	93
General	93
Humidity	93
Inertial	94
Key	94
Liquid Level	94
Pendant-Hoist	95
Pressure	95
Push Button	96
Reed	96
Rotary	97
Sensitive	97
Shaft	98
Snap Slide	98
Stepping	98
Thermal	99
Thermostat	99
Thumb Wheel	100
Toggle	100
Wave Guide	101

	Page
Synchro	101
Differential	101
General	102
Receiver, Transmitter	102
Resolver	103
Tank	103
Fuel Cell	103
General	104
Oil	104
Pressure Vessel	105
Storage	105
Time-Totalizing Meter	106
Counters	106
Timer, Electro-Mechanical	106
Transducer	106
Fluid Flow	106
General	107
Motional	107
Pressure	108
Tach Generator	108
Temperature	109
Valve	109
Ball	109
Butterfly	109
Check	110
Diaphragm	110

	Page
Valve (Cont'd)	
Fuel	111
Gate	111
General	112
Globe	112
Hydraulic	113
Needle	113
Oil	114
Plug	114
Pneumatic	114
Relief	. 115
Servo	115
Solenoid	116
Water	116

GENERIC FAILURE RATE TABLES

PART CLASS: ACCELEROMETER

TYPE: ANGULAR

				FATEURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
THE PRINCE OF ANY	APPL I	APPL I CAT I ON	(4	60% UPPER	60% CONFIDENCE INTERVAL	IC INTERVAL	NUMBER OF	OF IT OF STANSON	OPERATING HOUPS
ENA I ROGERIA	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECOPDS	NOTIBER LATER	(× 10 ⁶)
DOR	×			0.177	- * *		3	0	5.182

PART CLASS: ACCELEROMETER

TYPE: GENERAL

	5 HOURS	6)	240	112	8.638	387	741
	OPFRATING HOURS	(x 10 ⁶)	329.240	0.	ω.	2.	0.
	A TOTAL A SOMEON	MORBER TRILLE	138	0	303	367	8
	NUMBER OF	RECORDS	9	2	က	-	2
	NCE INTERVAL	UPPER	0.452	í ! ŧ	36.883	160.901	15.408
/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.389	:	33.373	146.965	7.535
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		8.179			
	(-	•	0.419	!		153.749	10.796
	APPLICATION	COML.					×
	APPL	HIL.	×	×	×	×	
		CNVINCAMEN	DOR	SAT	GRM	AI	ΑΙ

PART CLASS: ACCELEROMETER

TYPE: LINEAR

			***************************************		*				
				FAILURE RATE/10 HOURS	/10 HOURS				
	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	O S O S O S O S O S O S O S O S O S O S	OPERATING HOURS
ENV J KUNMEN	MIL.	MIL. COML.		CONF I DENCE	LOWER	UPPER	RECORDS	TOTOL LATER	(x 106)
DOR	×			0.324		ŧ :	4	0	2.826
AI	×		525.641		476.385	580.671		82	0.156

PART CLASS: ACCELEROMETER

TYPE: PENDULUM

		_							
		-		FAILURE RATE/10 HOURS	/10 ⁶ HOURS				
	APPLI	APPL I CAT 10N	«	604 UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER OF	NUMBER OF NEWBER EATER	OPERATING HOUR
ENVIRONMENT	<u>ع</u>	41L. COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	מסוימנת ומובנט	(× 10 ⁶)
DOR	×		1.923	1	1.449	2.554	2	12	6.239
1			The state of the s						

PART CLASS: ACCUMULATOR

TYPE: GENERAL

				FAILURE RATE/10 HOURS	/10 HOURS				
	APPLI	APPLICATION	¢	60% UPPER	60% CONFIDIT	60% CONFIDENCE INTERVAL	NUMBER OF	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	OPERATING HOURS
ENVIRONMENT	. J. E.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	MONDER TRIEFE	(x 10 ^{fi})
90R	×		0.324	:	0.276	0.381	S	33	102.003
SAT	×		i	1.693				0	0.541
GRM	×		29.851	-	12.143	64.524	~	2	0.067
AU	×		0.229	!	0.193	0.272	~ -1	30	131.000
AU		×	193.097	-	181.738	205.280	က	207	1.072
HEL	×		500.000		338.580	733.614		7	0.014

PART CLASS: ACCUMULATOR

TYPE: HYDRAULIC

		_							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				•
Tradamon of the	APPL I	APPLICATION	(4	608 UPPER	60% CONFIDENCE INTERVAL	VCE INTERVAL	NIMMER OF		OPERATING HOURS
INDINER	MIL.	COML.	ξ.	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILEU	(x 10 ⁶)
ava	>		0 521	,	0 513	033 0	,	707	688 001 1
3	<		100.0		0.313	0.000	٥	cna	744.8111
SAT	×		1.504	:	1.352	1.674	-	71	47.220
GRM	×		55.182		53.396	57.038	2	681	12.341
GR.		×	13.739	!	12.638	14.949	-	112	8.152
₽	×		156.365	1	152.606	160.234	2	1232	7.879
HEL	×		80.357	1	70.171	92.180	, 1	45	0.560

PART CLASS: ACTUATOR

TYPE: EXPLOSIVE

		•	لقنور ورسون منسوس ومونوان المانوا						
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
TNEWNOOTANE	•	APPLICATION	«	60% UPPER	50% CONFIDENCE INTERVAL	4CE INTERVAL	NIMBEDOF		OPERATING HOLDS
LINA I WOW I FIN		MIL. COML.	ľ	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	
DOR		×	0.063	1	0.048	0.082	1	13	207.100
GRF	×		218.765	!	156.468	305.193	1	6	0.041

PART CLASS: ACTUATOR

TYPE: GENERAL

				FAILURE RATE/10 ⁶ HOURS	7106 HOURS				
ENVIRONMENT	APPL	APPL I CAT I ON	«	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	ALIMBED OF		Sanda SattAdado
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	RECORDS NUMBER FAILED	(× 10 ⁶)
DOR	×			0.424			-		
AUT	:	×	101.429	t ::	98.806	104.134	-4 ,- -	0 1065	2.110
							•	222	000.04

PART CLASS: ACTUATOR

TYPE: HYDRAULIC

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS					
INSWNOGIANS	APPLI	APPL I CAT I ON	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	20 42471114			
	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	OFERALING HOURS (X 10 ⁶)	
DOR	×		0.290	!	0.057	0.880	2		3.454	

PART CLASS: ACTUATOR

TYPE: LINEAR

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPL 1	APPLICATION	«	60% UPPER		60% CONFIDENCE INTERVAL	RUMBER OF	AN THE CALL CO.	OPERATING HOUS
ENVIRONMEN	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECTIRES	NUMBER FAILED	(x 10 ⁶)
DOR	N/A	N/A			0.142	0.200	12	59	172.234
GRF	×		14.398	1	13.212	15.705	6	106	7.362
GRM	×		•		37.464	67.948	,	11	0.218
A	×		•		170.328	179.342	7	1104	6.317
AUT		×	•	:	68.195	71.452	2	1345	19.269
AUF	×		•	:	43.446	53.389	,,	9/	1.579
HEL	×		•	:	270.321	506.931	2	10	0.027
距		×		:	147.017	173,109	4	118	0.740
SHS	×		10.707		6.622	17.014	-	2	0.467
		1							

PART CLASS: ACTUATOR

TYPE: ROTARY

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
TUSHINGUI	APPL I	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	6.1. 1. 4.1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	OPERATING HOURS
ENVIRONMENT	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER PAILED	(x 10 ⁶)
V	>		40E 40E		363 666	330 061	-	225	0 555
- د ،	<		400.400	:	305.330	423.003	-	677	0.033
AUT		×	87.935	1	81.374	95.103	_	129	1.467
SUB	×		t 1	0.484	!	•		0	1.893

PART CLASS: BATTERY

TYPE: LEAD ACID

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				!
THOUSEN		APPLICATION	(60% UPPER	60% CONFIDENCE INTERVAL	INTERVAL	NUMBER OF	NIMBER OF	OPERATING HOURS
ENVINORMENT	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF		×	0.440		.0.298	0.645	2	7	15.917

PART CLASS: BATTERY

TYPE: MERCURY

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
TNAMNOGIANA	APPL !	APPL ICATION	(4	60% UPPER	604 CONFIDEN	60% CONFIDENCE INTERVAL	NUMBER OF	23.00	OPERATING HOURS
	MIL.	MIL. COML.		CONF IDENCE	LOWER	UPPER	RECORDS	NOMBER FAILED	(× 106)
GRF		×	0.742	1	0.559	986.0	4	12	16.164

PART CLASS: BATTERY

TYPE: NICKEL CADMIUM

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS			!	
THEMONOGIVERS	APPL 1	APPLICATION	(60% UPPER		60% CONFIDENCE INTERVAL	MIMBER OF		OPERATING HOURS
The Court of the C	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
SAT	×	×	0.047/CELL 0.251/CELL	1	0.027 0.235	0.078 0.268	6 2	4 171	85.862 681.593

PART CLASS: BATTERY

TYPE: NON-RECHARGEABLE

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
111111111111111111111111111111111111111		APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	And the state of t	OPERATING HOURS
E.NV I RUNMEN		MIL. COML.	~	CONFIDENCE	LOWER	UPPER		NUMBER FAILE	(× 10 ⁶)
GRM	×		333,333		66.047	1013.579	1	1	0.003

PART CLASS: BATTERY

TYPE: RECHARGEABLE

				Γ	_	_		_	_
		OPFRATING HOURS	(× 10e)		732.564	5.339	0.127	8.055	0.297
			NUMBER FAILED		12	, ∞	2	2810	201
		NIMBED OF	RECORDS		က		5	က	2
		HCE INTERVAL	UPPER		0.022	2.138	34.040	355,955	720.148
	/10 ⁶ ноикs	60% CONFIDENCE INTERVAL	LOWER		0.013	1.046	6.406	342.921	636.364
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		!	:	:	!	1 1
		«	3		0.016	1.498	15.748	348.852	676.768
•		APPLICATION	COML.						
		APPLI	MIL.		×	×	×	×	×
		EN SPREO O I AND S	EINY I KONMEIN (4 6 -	DOR	GRF	GRM	⋖	HEL

PART CLASS: BEARING

TYPE: BALL

			:	FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
ENVIDORMENT		APPLICATION	¢	60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL			
CIA LAGMINEM	MIL.	COML.	ζ.	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	OPERATING HOURS $(x 10^6)$
DOR	×		0.010		.0.007	0.014	3	6	903.040
SAT	×		:	0.688	1	:	2	0	1.332
GRF	×			1	1.001	1,319	8	44	38,320
GRF		× 	13.975		10,356	19.410		6	0.644
GRM	×				0.054	0.159	~	4	42.554
∢	×		5.133	1	4.787	5.507	2	158	30.784
⋖		×	1.372		0.272	4.171		F-4	0.729
ΑI	×				3.799	6.148		16	3.313
Æ	×		13.398	1 1	10.963	16.408	2	22	1.642
SHS	×		! !	0.053	, ,	:	7	0	17.156
SUB	×		4.728		1.923	10.220		2	0.423

PART CLASS: BEARING

TYPE: BUSHING

						1				
	!			FAILURE RATE/106 HOURS	E/106 HOURS					
	APPL	APPLICATION		203						
ENVIRONMENT			(<	SINCIF STOFF	60% CONFIDENCE INTERVAL	THE INTERVAL	20 a Jaking		700000000000000000000000000000000000000	
	MIL.	COML.	;	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	$(\times 10^6)$	
שמט		>			-		,			
ž.	:	<	-	0.046	1 1	1 1	~	C	19 922	
=	×			0.609		-	_		1 502	
◁		>	1	1 000	_		٠,	>	1.303	
	:	<	1	1.020	111		_	0	0.898	
	×		21.146		20.148	22,202	^	321	15 190	
					_	,	,	117	001.01	

PART CLASS: BEARING

TYPE: GENERAL

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	O J O J O J O J O J O J O J O J O J O J	OPERATING HOURS
ENVIRONMENT	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER CRIEFE	(x 10 ⁶)
<u>1</u> 2		×			3.200	5.180	2	16	3.933
GRF	×		1.378	:	1.084	1.754		16	11.614
Ξ.		×		:	18.721	25.719		34	1.551
	×			:	7.828	8.720	-1	261	31.598
		×		:	7.093	18.224	-	2	0.436
4	×			:	1.261	6.702	-	2	0.645
-:	×			! !	11,735	13.520	-	155	12.310

PART CLASS: BEARING

1.1

TYPE: NEEDLE

					9					
				FAILURE RATE/10" HOURS	/10 HOURS					
THE SMILE OF LAND		APPL ICATION	٠	60% UPPER		60% CONFIDENCE INTERVAL	JO BERNIN	MIMBER OF	OPERATING HOURS	
NY I ROINTEN	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)	
4		×		2.718			1	0	0.337	

PART CLASS: BEARING

TYPE: ROLLER

		-							
				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
111111111111111111111111111111111111111	APPL I	APPL ICATION	(-	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF		OPERATING HOURS
משוביא ו	MIL.	COML.	ζ.	CONFIDENCE	LOWER	UPPER	RECORDS	NOTION THE LEGIS	(× 106)
RF	×				0.195	0.400	1	83	28.562
GRM	:	×	207.328		195.811	219.633		232	1.119
	×				0.641	1.162	-1	11	12.745
		×		0.628	:	# - f	r1	0	1.459
	×		!!	0.037			_	0	24.570
¥	×		1.206		0.693	2.039	,	4	3.317
	×		24.000		15.634	36.457	,	9	0.250

PART CLASS: BEARING

TYPE: SPHERICAL

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS			;	
THOMACOLAND	APPLI	APPLICATION	«	60% UPPER		60% CONFIDENCE INTERVAL	NIMBED OF		OPFRATING HOUSE
ENVINCENT	MIL.	COML.	C	CONFIDENCE	LOWER	UPPFR	RECORDS	NUMBER FAILED	(x 10 ₆)
GRM	×		0.206		0.169	0.252	,	22	106.731
Ø	×		8.260	1 1	7.828	8.720	-	261	31.598
AUT		×	9.000	!	7.524	10.787	<u></u>	27	3.000
HEL	×		53.220	1 - 1	49.623	57.119		157	2.950

PART CLASS: BELLOWS

TYPE: DIAPHRAGM BURST

		-		EALLINE RATE/106 HOURS	/106 HOURS				
				1015					
	1 32	1001.20	·	60% UPPER	60% CONFIDENCE INTERVAL	٦		NUMBER FAILED	OPT PATING HOORS
Tivania		APPLICATION	(~	SINGLE-SIDED	1	03001	RECORDS		(01 %)
ENVIRONMEN		IMOS ITA		CONFIDENCE	LOWER	UPTER			
								,	697.0
30	;			1 384		1 5	,	3	0.002
ž	~			1.004	7	7			
				!					

PART CLASS: BELLOWS

TYPE: EXPLOSIVE

		•							
				FAILURE PAIE/10" HOURS	710" HOURS				
	1000	MOLLEY	,	603 UPPER	60% CONFIDENCE INTERVAL	CE INTERVAL	NUMBER OF	NUMBER OF NUMBER FAILED	OPERALING MOORS
APPLICATION	AFFE	APPLICATION	(~	SINGLE -SIDED	<u> </u>		PECOPDS		(x 10°)
NVINUMMER		SMOS .		CONFIDENCE	LOWER	UPPER			
							•	(200
4	,			0.014	1	1 1	~ ₹	⊃	63.000
ž	<u>~</u>		1	1 1010					
			A						

PART CLASS: BELLOWS

TYPE: GENERAL

	- - -	(PI ×)		13.520	0 014			
	NUMBER OF NUMBER FAILED			_	· c	>		
	NUMBER OF	RECORUS		_	4 •	٠,		
	ICE INTERVAL	UPPER			;	, ,		
/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	d SMO 1	LONE		1	1,7		
FAILURE RATE/10 ⁶ HOURS	60% UPPER	SINGLE - SIDEO	COMPTDENCE		0.068	65 A29	03:463	
	<	~			-		! !	
L	APPLICATION		MIL. COML.					
	APPL		MIL.		>	< :	× 	
		ENVIPONMENT				Š	GRF	

PART CLASS: BRAKE

TYPE: GENERAL

				FAILURE RATE/10 HOURS	710 ⁶ HOURS				
THE PROPERTY OF THE PARTY OF TH	APPL I	APPLICATION	(4	60% UPPER	60% CONFIDE	60% CONFIDENCE INTERVAL	JO BJUMIN		OPERALING HOURS
UNITERNI	. JIH	COML.	C	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER LAILED	(× 10e)
GRF	×		4.274		0.847	12.995	H	_	0.234
	×		Ġ.	1	760.349	772.207		11,965	15.615
	×		213.143		209.249	217.123	,I	2,131	9.638
_		×	11.570	1	7.835	16.976	က	7	0.605
	×		100.000	!	94.333	106.062	-1	223	2.230

PART CLASS: BRAKE

TYPE: MAGNETIC

				FAILURE RATE/106 HOURS	/106 HOURS					
FINAMINOTANA		APPLICATION	(-	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	o de de de la constante de la		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
THE POSSIBLE AND THE PARTY OF T		MIL. COML.		CONFIDENCE	LOWER	UPPER	PECORDS	NUMBER FAILER	(900 8)	
l		_								
GRF	×		11.976	1	6.877	20.245	-	4	5.334	
HE	×		241.540		227.332	256,780	3	207	0.857	

PART CLASS: BRUSH

TYPE: ELECTRIC

				FAILURE RATE/15 ⁶ HOURS	/15 ⁶ HOURS				
111111111111111111111111111111111111111	APPL I	APPL I CAT I ON	<i>(4</i>	60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF	NEWINE OF COMMENT	OPERATING HOUSES
NOW WELL	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RE+ ORDS	11 13 1 W 1 3 10 W(B)	(x 106)
A SHS	××		4.749	0.152	4.461	5.058		195 0	41.062 6.030
					The second secon				

PART CLASS: CIRCUIT BOARD

TYPE: PLATED THROUGH HOLES

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS					
	APPL 1	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	JCE INTERVAL	NUMBER OF	a i Baidi	OPFRATING	
T A LEGISLA	MIL.	COML.	ζ ,	CONFIDENCE	LOWFR	agado	RECORDS	LARTE	(106)	
DOR	×			0.000251		t 1	1	0	3643.900	
DOR	:	×		0.000112		1		0	8183.538	
SAT	×		1 1	0.000278		!		0	3298.700	_
GRM		×	0.000219		0.000049	0.000655	.		4577.251	_
AIT	×		0.000110	1	0.000045	0.000233	4	2	18444.416	_
AIF	×		0.000702	1	0.000474	0.001030	4	_	9974.127	

PART CLASS: CIRCUIT BOARD

TYPE: PRINTED CIRCUIT BOARD, SINGLE LAYER

APPLICATION							-			
A A A A A A A A A A					FALLURE RATE	/10 ⁶ HOURS				
X 0.826 0.184 2.479 1 X 0.163 0.036 0.490 10 X 0.163 0.036 0.490 10 X 0.063 0.007 0.110 9 X 0.004 0.001 0.012 1 X 1.849 0.412 5.545 14 X 5.091 1.138 15.306 22 X 1.682 1.203 2.336 1		APP. 1	CATION	<i>(-</i>	60% UPPER	EDS CONFIDER	ACT INTERVAL	हेट ज स्ट्रेस्स्स	11.00	OFF PATTM.
X 0.826 0.184 2.479 X 0.163 0.036 0.490 X 0.036 0.007 0.110 X 0.004 0.001 0.012 X 1.849 0.412 5.545 X 5.091 1.138 15.306 X 1.682 1.203 2.336	. NV I RONMENT	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	FE CORDS	11111	(104)
X 0.163 0.036 0.490 X 0.036 0.007 0.110 X 0.004 0.001 0.012 X 1.849 0.412 5.545 X 5.091 1.138 15.306 X 1.682 1.203 2.336	DOR	×		0.826	-;	0.184	2.479	-	1	1.210
X 0.017 0.007 0.110 X 0.004 0.001 0.012 X 1.849 0.412 5.545 X 5.091 1.138 15.306 X 1.682 1.203 2.336	GRF		×	0.163		0.036	0.490	10	~	6.119
X 0.036 0.007 0.110 X 0.004 0.001 0.012 X 1.849 0.412 5.545 X 5.091 1.138 15.306 X 1.682 1.203 2.336	GRF	×		!	0.017	1 1	;		0	54.700
X 0.004 0.001 0.012 X 1.849 0.412 5.545 X 5.091 1.138 15.306 X 1.682 1.203 2.336	GRM		×	0.036	:	0.007	0.110	6		27.420
X X 1.849 0.412 5.545 X 5.091 1.138 15.306 X 1.682 1.203 2.336	V	×		0.004	;	0.001	0.012	-		249.000
X 5.091 1.138 15.306 X 1.682 1.203 2.336	AIT		×	1.849	:	0.412	5.545	14	~	0.541
X 1.203	AIF	×		5.091		1.138	15.306	22	-	0.196
	SHS	× 		1.682	1	1.203	2.336	,	6	5.350

PART CLASS: CIRCUIT BOARD

TYPE: PRINTED CIRCUIT BOARD, MULTILAYER

i				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
	APPL 1	APPL I CAT I ON	«	60% UPPER	. 60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF	NUMBER	OPERATING HOLDS
ENV I KONMEN	MIL. COM	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	FATLED	(106)
DOR	×		0.083		0.017	0.254	134	-	11.985
GRM	×		0.131	(! }	0.100	0.181	213	13	809.66
									┥

PART CLASS: CIRCUIT BOARD

TYPE: TERMINAL

		•							
				FAILURE RATE/10 6 HOURS	/106 HOURS				
	_	APPL 1CATION	é	60% UPPER		608 CONFIDENCE THER WAL	10 d all	Q a q a q a q a q a q a q a q a q a q a	OPTRAITMG HOURS
ENVIRONMENT	MIL.	COML.	<	CONFIDENCE	LOWFR	UPPER	RECORDS	MONIBLE CALLED	(x 10b)
ď	~		4.946	: i	4.612	5,307		158	31.948
. α		× —	1	32.714	1 1	í t	-	0	0.028
AIF	×		1	0.335	l i	! ;	2	0	0.730

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: FUSE

		SAAA		58	50	28	00	50	17
		SHAOH SNIIVBIAO	(x 10 ₆)	2.168	3.850	529.168	0.100	0.020	48.577
		33 11 4 3 6 3 6 3 6 1 1 1	NUMBER INICID	0	0	72	7	4	9
		NUMBER OF	RECORDS	2		,-	-1	-	
		NCE INTERVAL	UPPER	:	:	0.151	29.994	338.090	0.188
	/10 ⁶ ноикs	60% CONFIDENCE INTERVAL	LOWER		:	0.122	2.226	114.852	0.080
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	0.423	0.238	-	1.	;	
		«	<	!	;	0.136	9.980	200.000	0.124
•		APPL I CAT 10N	COML.					×	
		APPL I	MIL.	×	×	×	×		×
			ENV I KONMEN I	DOR	SAT	GRF	AIF	HEL	SHS

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: FUSE HOLDER

		-							
				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
FNVIDONMENT		APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL		4	OPERATING HOURS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS		(x 10 ⁶)
GRM	×		0.016	:	0.007	0.035	2	2	124.181
AIF	× —		:	9.142	!	1 1	-	0	0.100
SHS	×		!	0.021	1 1	-	-	0	44.480

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: GENERAL

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
		APPLICATION	(-	60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	OPERATING HOURS
ENV I KONNEN I	MIL.	COML.	ξ.	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER TAILED	(X 186)
CAT	^		i .	-	25, 691	74 969	2	4	8.937
GRF	× ×		0.683		0.608	0.767	16	61	89.359
GRM	: ×				0.631	0.887	2	30	40.125
A	×		•		1.858	2.082	~	236	119.998
. A		×		10.905				0	0.084
Ή		×	•		11.622	61.759		2	0.070
SHS	×		0.268	! ! !	0.053	0.814	2	,	3.737
SUB	×	~	•		37.285	46.398	2	89	1.636
				_	•				

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: MOLDED CASE CIRCUIT BREAKER

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноияs				
Timahina	APPL 1	APPLICATION	(4	GOS UPPER	60% CONFIDENCE INTERVAL	INTERVAL	NIMBER OF		OPERATING HOURS
CNV I ROMANCINI	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILE	(x 10 ₆)
GRF	×		1.107		.0.932	1.318	14	62	26.186

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: POWER SWITCH, CIRCUIT BREAKER

		_								
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS					
FNVIRONMENT	APPL I	APPL 1CAT 10N	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	Author OF		ODEDATING HOUSE	
	MIL.	COML.	x	CONFIDENCE	LOWER	UPPER	RECOPUS	NUMBER FAILED	(x 10 ⁶)	
GRF	×		2.879		1.876	4.373	3	9	2.083	

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: SPARK GAP, SURGE PROTECTION

				FAILURE RATE/10 ⁶ HOURS	:/10 ⁶ HOURS	-				
ENVIRONMENT		APPL ICAT ION	«	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL				
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(X 10 ⁶)	
DOR	×		0.012		.0.002	0.036	2	-	84 790	
							1	•	067:10	

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: UNDERVOLTAGE

				FAILURE RATE/10 ⁶ MOURS	/10 ⁶ HOURS				
ENV S RONMENT	APPL !	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NIIMOR D		
	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	$(x 10^6)$
GRF	×		1.870	;	.1.305	2.669	2	α	876 1
								>	0/3:

PART CLASS: COMPRESSOR

TYPE: AIR

		4		CATHURE BATE/106 HOURS	/106 HOURS				
				LAILONE RAI					
	1004	ADDITCATION	~	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER FAILED	OPERATING HOURS
ENVIRONMENT			ζ<	SINGLE-SIDED	OWER	UPPER	RECORFS		(X 10-7)
		MIL. COML.		CONFIDENCE	١				
						ACA T		19	3.188
MGC	>		5.959	!	4.793	1.424	٠.	00	0.067
	< >		720 694		633,177	821.659			
SHS	۷		, -2, 2,						

PART CLASS: COMPRESSOR

TYPE: GENERAL

					9				
				FAILURE RATE/10 HOURS	/10 HOURS	+			
		NOT TATE OF	\ \	60% UPPER	608 CONFIDENCE INTERVAL	ICE ENTEPVAL	NUMBER OF	NUMBER OF NUMBER FAILED	OPERATING HOURS
ENVIRONMENT				SINGLE - SIDED	LOWER	UPPER	RECORDS		(x 10.2)
	MIE.	MIL. LUML.							
	,			2 7.42				0	0.244
20 20 -	× _	-	1 1	24/16	200 000	200 1100	-	1106	0.555
٦	×	_	1992.793		1946.660	776.4407	1	20.23	
2	:	_							

CONNECTION

INTER GENERAL SOLDER

				FAITURE PATE/10 HOURS	/10 ⁶ HOFFS				
	1795	APPL LCATION	۶	603 UPPLR	60% CORFIDENCE INTERVAL	HCE INTERVAL	Marte et en	:	4144141
History.	- - - -	MIL COME.	<	COURTDENCE	LOWEP	andan	PET COLUMN	1.17.	9019
DOR	×			0.000151			1	0	6101.826
GRF	×		0.000644		0.000497	0.000835	-	14	21740.000

MAKE CLASS: CONNECTION

TYPE: HAND LAP, SOLDER

				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
		APPLICATION	¢	60% UPPER	60% UPPER 60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER OF NUMBER EATER	OPERATING HOURS
ENVIRONMENT	3 1.	MIL. COML.	<	CONFIDENCE LOWER	LOWER	UPPER	RFCORDS		(301 x)
DOR	××		0.000150	0.000025	0.000139	0.000139 0.000259		10 0	52594.180 39610.000

PAPT CLASS: CONNECTION

TYPE: WAVE, SOLDER

				FALLURE PATE/106 HOURS	/10 ⁶ HOURS				
	APPLI	APPLICATION	(-	60% UPPER	60% UPPER 60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBE P. C.S.	NUMBER OF	COFPATING 185, PS
ETIV I KORALET	31.	MIL. COML.	ς	CONFIDENCE	1 OWF R	UPPER	PERMIT	NOMBER TRIES	cy 10 ⁶ 1
SHS	×		690000.0		0.0000397	0.00012	1	4	57835.239

PART CLASS. CONNECTION

TYPE - MIRE WRAP

					9				
				FALLINGE PATE/10 MINJPY.	/ 10 Maily.				
	APPLICATION	ATTON	(4	81330 E09	ty tellfill for full for the little to the	ICE THIEFTAL	transiant pro-disented the	. 1 1111111	ver BATTite.
The state of the s	Prop 111W	c undi	τ	COMFIDERCE	a JM. i	6 43 10	profett	= 1	< 10,0
GRF	×		0 000355		0 oods s.	0 Jun 538		L	16899,888

PART CLASS: CONNECTOR

TYPE: CIRCULAR

							_		
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноияs				
THERMAN	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER OF	43 6369114	OPERATING HOURS
COMPLEM	MIL.	COML.	t	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER FAILED	(x 10 ⁶)
OR OR	×			0.026	,;;	1	-1	0	34.627
AT	×		-	0.016	-	;	10	0	57.509
RF	×		0.366	!	0.338	0.395	31	130	355.656
₹	×			16.357	:	;	5	0	0.056
A	×		0.839	!	0.798	0.882	2	308	367.203
_	×		;	3.664		1 1	15	0	0.250
	×		1.248	:	1.181	1.303	က	257	205.916
H.	×		1	0.920	1	1 ,	5	0	0.996
ES.	×		0.071	f	0.055	0.092	81	14	197.465
89	×		:	1.196	-		59	0	0.766

PART CLASS: CONNECTOR

TYPE: COAXIAL

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
TWOMMENT	APPL	APPL ICATION	«	60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	NIMBED OF		OPFRATING
LINETER	MIL.	COML.	•	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(y01 x)
SAT	×		0.023		500.0	0.070	12	-	030 00
ניני	>					0.00	77	1	707.64
GRF	<		0.18/	!	0.164	0.215	31	45	240.318
GRF		×	-	0.019	-	1	Z.	C	48 700
V	N/A	N/A	0.672	: :	0.610	0.740	٦.	9,9	120,000
Æ		×	10.000		1.981	30, 407	·	}	00.000
SHS	×	_	0.017	!	0 003	0.053	, (67.253
				_	0000	000.0	3	7	007.10

PART CLASS: CONNECTOR

TYPE: GENERAL

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
		APPLICATION	«	60% UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL	NUMBER OF	4 du	OPERATING HOURS
ENVIKONMENI	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	WORDER CALLED	(x 10 ⁶)
ave	>		00 0		0 001	200 0	Ç	17	11 624 404
3	< :		100.0		100.0	200.0	٠,٠	/1	+6+.+30,11
SAL	~ ~			0.023	;	1 1		<u> </u>	40.000
GRF	×		0.036		0.024	0.053	14	7	195.446
GRF		×	0.689		0.154	2.067		-	1.451
GRM	×		!	6.596		1	က	0	0.139
GRM		×	-	0.271	! !	1	1	0	3.380
Ø		×	0.351		0.334	0.369	7	305	868.805
ΑI	×		0.130	-	0.026	0.394	42	-	7.717
AI		×	!	3.915	!		15	0	0.234
AUŢ		×	1	0.387		1	2	0	2.368
HEL	×		10.270		8.261	12.794		19	1.850
SUB	×		0.051	:	0.041	0.063	64	50	391.136
		-							

PART CLASS: CONNECTOR

TYPE: PHONE

		_							
				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
THEMMORIAN	APPL I	APPL I CAT ION	Œ.	60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF	a a a a a a a a a a a a a a a a a a a	OPERATING HOURS
THE PROPERTY OF	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	MONBER INIEE	(x 10 ⁶)
SHS	×			1.990		:	1	0	0.460

PART CLASS: CONNECTOR

TYPE: PIN

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
	APPLI	APPL I CAT 10N	¢	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	NIMBED EATHER	OPERATING HOURS
ENV I RONMENT	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	אסשפרא ואזרכט	(× 10 ⁶)
DOR	×			0.0003200	.;	1 - 1	1	0	2798.310
SAT	×		:	0.0004200			2	0	2208.930
GRF	: ×		:	0.0010000	;	411		0	1514.246
GRM	×		0.011		0.007	0.017	-	9	529.200
AIT	×			0.0000904			-1	0	10130.000
	_								

PART CLASS: CONNECTOR

TYPE: POWER

	OPERATING HOURS	(× 10 ⁶)		6.740	0.626
	OPERAI	(X			
	NUMBER OF MILLER FALLER	NOMBER TRILL		0	2
	NUMBER OF	RECORDS	,	_	4
	60% CONFIDENCE INTERVAL	UPPER		-	6.903
710 ⁶ HOURS	i ,	ГОМЕК	•	1	1.299
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		0.136	!
	«	ζ		:	3.194
	APPL I CAT I ON	IL. COML.			
	APPL	MIL.		×	×
	FIRST	ENVIRONMEN		GRF	AIF

PART CLASS: CONNECTOR

TYPE: PRINTED CIRCUIT BOARD

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
111111111111111111111111111111111111111	APPL	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBED OF		OFF PATING HOURS
Come	MIL.	COML.	K.	CONFIDENCE	LOWER	UPPFR	RECORDS	NUMBER FAILED	(x 10 ₆)
٩	,			1000	,		,		44.40
×	<	_	111	COD:0	() 1		-	-	14.140
<u>-</u>	×		! ! !	0.044	;	1 6 6	2	0	20.797
щ	×		: :	0.031	-	! !	12	0	3.044
Σ	×		1 1	0.025	-	!	2	0	36.745
AI	×		0.171		0.308	0.512	2	 4	5.860
Į,	×		1 ,	0.026			19	0	34.890
S	×		0.011	1	0.005	0.024	2	2	176.678
	×		1	12.053	ł 3		4	0	0.076

PART CLASS: CONNECTOR

TYPE: RADIO FREQUENCY

				FAILURE RATE/10 HOURS	/106 HOURS				
	APPLI	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	INTERVAL	100 40 100 110		CMITAGOOG
ENVIKONMENI	MIL.	MIL. COML.	•	SINGLE-SIDED CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(× 10 ⁶)
GRF	×		0.062	1	0.052	0.074	1	27	434.534

PART CLASS: CONNECTOR

TYPE: RECTANGULAR

					9				
				FAILURE RATE/10 HOURS	/10 HOURS				
	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER OF	OS CLASS OSBANISA	OPERATING HOURS
ENVIRONMEN	Η۱۲.	COML.	ξ	CONFIDENCE	LOWER	UPPER	RECORDS	ממופרה ושורה	(x 10 ⁶)
SAT	×			0.402	, ,		3	0	2.279
GRF	×		0.097		090.0	0.155	12	വ	51.315
GRF		×	!	0.007	,	:	-	0	140.018
V	×		1.087		0.988	1.200	2	85	78.128
4		×	1.273		1.156	1.404	,4	85	66.762
AI	×		1	0.554	j l		19	0	1.653
SUB	×		!	3.084	, .		16	0	0.297

PART CLASS: CONNECTOR

TYPE: TEST JACK

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноияs				
200		APPL I CAT 10N	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERNAL	NUMBER OF	0000	OPERATING HOURS
ENVIRONMENT	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS		(x 10 ⁶)
GRF	×		0.003		.0.002	0.004	9	14	4515.305
AIF	×	_	1	0.119	1		-	0	7.715
SHS	×		0.011	1	0.008	0.015		6	8444.861

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: AIR PRESSURE GAUGE

				FAILURE RATE/10 HOURS	/10 ⁶ HOURS				
	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	O S FI W I O TOWNING	OPERATING HOURS
	MIL.	MIL. COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	MONDER FAILED	(× 10 ⁶)
 	>		2 611		. 2, 251	3.035	4	38	14.551
_	< >		1.020	!	0.796	1.311	2	15	14.699
	×		35.185	-	28.300	43.830	1	19	0.540
_									

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: ALTIMETER

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноияs				
Lina Seria Od I Alia 3	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF		OFFRATING HOURS
ENVIRONMENT	MIL.	MIL. COML.	t	CONFIDENCE	LOWER	UPPER	RECORDS	HUMBER FAILER	CZ 1062
AI HEL	N/A X	N/A	130.506 269.608	: :	121.768 254.226	139.967 286.071	4	160 220	1.226 0.816

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: AMMETER

					salion ger,				
				FAILURE RAIE/18 MONS	file mones				
	1 lags	NOT LCALLON	Ý	60% UPPER	60% CONFIDENCE INTERVAL	CE INTERVAL	NUMBER OF	NUMBER FAILED	OPERATING HOURS
ENV I RONMENT			ζ<	SINGLE-SIDED	LOWER	UPPER	RECORDS		(×)0°)
	MIL.	COML.							
					,	015	-	رد	57 408
	,		7336	:	0.298	0.450	-	17	\$00.00
	×		0.00		200	21 708	_	23	0.884
Way.		× 	1 26.018	1	77.334	51.700	4 (•	0 133
3 0	>	:	7 491	, ,	1.484	22.111	7	1 .	200
<u> </u>	< -		•		000	101 162		448	4.014
ZIIS	×		960.76	-	93.660	101.101	•		
70C -	:								

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: COMPASS

		-							
				FAILURE RATE/10" HOURS	/10" HOURS				
					l				
	APPI	APPLICATION	<	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER FALLED	OPERATING HOURS
ENVIRONMENT			*	SINGLE-SIDED	OWER	UPPER	RECORDS		(x 10°)
	٦.	MIL. COML.		COM LOLINGE					
					,				
		:			0,00	42 700	,	УС	0 665
T W		×	36.090	1	718.67	43.705	?	1.7	
ũ,	>		252 941	1 ()	220.137	291.147	~	43	0.1/0
ر د ا	<		101111						

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: INDICATOR

APPLICATION A 60% UPPER 60% CONFIDENCE INTERVAL	01/	01/	/10 ⁶ HOURS 60% CONFIDE	, , z –	ICE INTERVAL	NUMBER OF RECORDS	NUMBER FAILED	0Pt RATTHS TROURS
~	OMC.		CONFIDENCE	LOWER	Urrek			
		;	0.904	!!	t i	- 4	0	1.013
		3.907	:	3.585	4.262	4	106	27.130
×		70.413	1	64.696	76.709	2	109	1.548
		165.406	!	163.744	167.087	-	7039	42.556
×		163.747		160.608	166.960	∞	1935	11.817
	_	166.956	!	162.167	171.912	18	998	5.187

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: MAGNETIC SENSING

	TO GIRWIN	NUMBER FAILED	8 2 0 0.502 8 1 69 0.280			
10 b HOURS	60% CONFIDENCE INTERVAL	LOWER	221.241 274.848			
FAILURE RATE/106 HOURS	60% UPPER	CONFIDENCE	1.825			
	<i>(</i> *	•	246.429			
	APPLICATION	COML.	×			
	APPL	MIL.	×			
	THE PRINCE THE PERINCE	ENVIRONMENT	SAT			

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: RATE OF FLOW INSTRUMENT

		•							
				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
		APPLICATION	4	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	TOWNER OF NIMBER FAILED	OPERATING HOURS
ENV I RONMENT	1	MIL. COML.	∢	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10°)
GRF	×		8.363		7.209	9.720	4	38	4.543

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: TACHOMETER

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ нои к s				
	APPLI	APPL 1 CAT 10N	¢	60% UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL	NUMBER OF	MINDED EATTED	OPERATING HOURS
ENV I RONMENT	¥11.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	MOTOR A CALLEY	(× 10¢)
GRM	×		•	!	9.675	11,808	,_	81	7.583
		87.14			100 01	300 00	·	0,	VU8 U
ī	Z X	۲ /۲ ۲			166.01	29.390	7	7.7	100.0
Ή	×		37.500	:	26.821	52.315	2	6	0.240
SIB	×		2 298	1	1.319	3,884		4	1.741
2	:		•						

PART CLASS: EMERGENCY LIGHT

TYPE: GENERAL

				,					
			FAILURE RATE/106 HOUPS	/10 ⁶ HOUPS					
	APPL I CAT 10N	¢	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NIMBER OF	Carrya asemin	OPEPATING HOURS	
ENVIRONMENT MI	11 COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	TOTAL TOTAL	(× 10¢)	
GRFX		1.966		1.601	2.421	2	21	10.678	

PART CLASS: FAN

TYPE: AXIAL

		•							
				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
1	APPL I	APPLICATION	¢.	60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	NUMBER OF	73 11 43 G3G7117	OPERATING HOURS
NY I KONINEN I	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
~	×			0.126			2	0	7.260
GRF	×		-	0.510	1 1		4	0	1.796
		×	1.854		1.353	2.538	2	10	5,393
	×		9.615	*	4.908	17.812	т	m	0.312
	×		211.557	*	199.376	224.604		216	1.021
		×	5.510	,	2.241	11.909	2	2	0.363
		×	1	57.250	. ! !	:-	-	0	0.016
	×		1296.089		1224.091	1373.015	m	232	0.179
	×		100.000	,	19.814	304.074		,	0.010
	×		10.926	,	8.788	13.610		19	1.739
	×		1.552	1	1.248	1.946	-1	18	11.600

PART CLASS: FAN

TYPE: CENTRIFUGAL

		Operative Series	(x 106)	0.541	2.568	13.114	4.787	0.184	0.356
			NUMBER FAILFD	С	0	16	427	4	m
		o di dell'ille	RECORDS	2	5	2	-	-	H
		ICE INTERVAL	UPPER	:	!	1.553	93.031	36.749	15.610
	/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER		!	0.960	85.552	12.484	4.301
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	1.692	0.357	-	1	1	1
		*	<	-	!	1.220	89.200	21.739	8.427
•		APPLICATION	COML.					×	
		APPL	MIL.	×	×	×	×		×
		THE STREET	ENVIRONMENT	DOR	GRF	GRM	А	4	SUB

1

PART CLASS: FAN

TYPE: GENERAL

ļ	y,			_			_		_				
	OPERATING HOURS	(x 10 ₆)	2.200	34.557	6.082	10.715	38.704	0.067	8.683	0.175	1.430	8.138	10.953
	ATTENDED PAINTE	MOTOR A LATER	0	87	17	29	1428	2	622	0	13	112	5
	NUMBER OF	RECORDS	2	9	4		Н	~	2			2	2
	60% CONFIDENCE INTERVAL	UPPER		2.773	3,530	6.986	37.741	118,592	74.160	1 1	11.922	14.973	0.725
/10 ⁶ HOURS		LOWER		2.289	2.217	5.604	36.072	46.157	69.208	! { !	6.938	12.659	0.282
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	0.416	:	!	-			:	5.234	1	!	! :
	*	£		2.518		6.253				1	9.091	13.761	0.456
	APPLICATION	COML.			×				×				
	APPL 1	M1L.	×	×		×	×	×		×	×	×	×
		ENVINORMENT	90K	GRF	GRF	GRM	4	Au	AIT	AIF	HEL	SHS	SUB

PART CLASS: FILTER

TYPE: FLUID

		HOURS		,		6	_ 0		3	4		7
		OPERATING HOURS	(x 10 ₆)	00 0	0.0	11.67	12.43	1.152	4.31	1.56	0.11	0.72
			NUMBER FAILE	c	>	35	37	74	66	104	,I	36
		NIMBER OF	RECORDS	-	4	m	٣	2	7	က	~	4
		608 CONFIDENCE INTERVAL	UPPER		1	3.507	3.467	71.359	25.118	72.598	25.989	57.813
	/106 HOURS	60% COMFIDE	LOWER			2.566	2.560	57.898	20.997	60.967	1.694	42.495
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	0000	776.0	:		!			!!	1
		«	ζ .			2.997	2.977	64.236	22.954	66.496	8.547	49.519
•		APPL I CAT I ON	COMIL.					×		×		
		APPL I	MIL.	>	<	×	×		×		×	×
			ENVIKUNDENI	god	222	GRF	GRM	GRM	Au	AUT	AUF	HEL

PART CLASS: FILTER

TYPE: GAS

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
FWVTDOWNENT	APPL I	APPLICATION	«	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	1	OPERATING HOURS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ₆)
GRF	×		1.201	:	0.813	1.763		7	5.827
GRM	×		2.746	1	2.120	3.562	-	14	5.098
AUT		×	2.193	!	0.435	6.668			0.456
HEL	×		25.974	!	10.566	56.144	2	2	0.077
									T

PART CLASS: FILTER

TYPE: GENERAL

				FAILURE RATE/106 HOURS	/106 HOURS				
Turning of Vita	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF		OPEDATING MOUDS
THE TROUBLE IN	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 106)
DOR	×		~	0.035			2	C	25.867
SAT	×		-	0.206	;	: :		00	4.450
GRM		×	66.185	;	58.602	74.865	2	55	0.831
AU		×	-	0.954	-	;	-	0	0.960
AUT		×	54.490		49.000	60.673		71	1.303
핖	×		1.265		1.024	1.566		20	15.810

PART CLASS: GASKET AND SEAL

TYPE: GASKET, SHIELDING, RFI

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
THE CONTRACTOR	APPL)	APPL I CAT I ON	«	60% UPPER	60% CONFIDENCE INTERVAL	INTERVAL	NUMBER OF	COLLAD COMMIN	OPERATING HOURS
CNV 1 KONTHEIN	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER TAILED	(x 10 ⁶)
GRF	×		938.0		0.145	0.769	1	2	5.619

PART CLASS: GASKET AND SEAL

TYPE: GENERAL

				The state of the latest designation of the l					
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPLI	APPLICATION	(4	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	4	OPERATING HOURS
ENVIRONDEN	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
DOR	×			0.004		1 1	3	0	221.680
GRF	×		1.338		1.052	1.704	m	16	11.959
GRM		×	1.148	:	1.050	1.256	4	66	86.248
A	×		65.788	! : :	65.251	66.330	က	10,647	161.838
4		×	1.486		0.294	4.518		~	0.673
AUT		×	122.271	:	113.516	131.803		140	1.145
Æ	×		31.594	!	30.046	32.967	က	301	9.527
SHS	×		3.767		2.797	5.073		11	2.920
				-					

PART CLASS: GASKET AND SEAL

TYPE: 0-RING

				FAILURE RATE/106 HOURS	1/106 HOURS				
ENVIRONMENT	APPL	APPLICATION	«	60% UPPER		60% CONFIDENCE INTERVAL	30 430000		
	MJL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	OFERALING MOURS (X 10 ⁶)
8	×		-	0.078	. :			_	11 699
GRM	×		0.530	1	0.304	0.895		7	7 552
4	×		2.387	!	2.081	2.743		44	18 431
SHS	×		0.454	}	0.232	0.836	l (r)	- (*)	6.602
_							,	•	1000

PART CLASS: GASKET AND SEAL

TYPE: PACKING

		-							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
THEMOONE	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	UCE INTERVAL	MIMBED OF		SQUOR SWILL
E NATURAL DE LA COMPANSION DE LA COMPANS	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10e)
DOR	×			0.002	· •			C	581.360
GRF	×		3.531		2.525	4.926		o 0	2.549
GRM	×		0.274	;	0.111	0.591		2	7.310
4	×		1.512	-	1.199	1.910		17	11.244
HEL	×		5.063	!	4.866	5.270	-	471	93.020
	ا								

PART CLASS: GENERATOR

TYPE: AC

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	_	APPL I CAT 10N	«	60% UPPER	60% CONFIDENCE INTERVAL	INTERVAL	NUMBER OF	CHITAT GRAMMA	OPERATING HOUPS
ENVIRONMENT	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10°)
DOR	×		0.806		.0, 598	1.082	2	11	13.641
SHS	×		0.023	;	0.016	0.033	1	8	341.000

PART CLASS: GENERATOR

TYPE: DC

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
		APPL I CAT 10N	(*	60% UPPER	60% CONFIDENCE INTERVAL	JCE INTERVAL	NUMBER OF	CONTRACTOR	OPERATING HOURS
ENVIRONMENT	. JIH	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER TAILED	(x 10 ⁶)
GRM	×			!	34.482	39.264	2	183	4.975
₽	×		489.649		471.915	508.168	2	544	1.111
표	×		205.882		139.415	302.076	H	7	0.034

PART CLASS: GENERATOR

TYPE: DIESEL ENGINE

		•							
	,			FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
T TO SHIRLD OF THE	APPL I	APPL I CAT I ON	٠	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	3.0 m	OPERATING HOURS
ENVINONMEN	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	MONBER FAILED	(x 10e)
DOR	×		1.292		0.875	1.895	1	7	5.418

PART CLASS: GENERATOR

TYPE: GAS ENGINE

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	CE INTERVAL	NUMBER OF	NUMBER OF NUMBER FALLED	OPERATING HOURS
ENV I RONMENT		MIL. COML.	<	SINGLE - SIDED CONFIDENCE	LOWER	UPPER	RECORDS		(× 10 ⁶)
DOR	×		2.702	!	1.099	5.840	2	2	0.740

PART CLASS: GENERATOR

TYPE: GENERAL

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	NIMBER FAILED	OPERATING HOURS
ENVIRONMENT	H ! .	SOML.		CONFIDENCE	LOWER	UPPER	RECORDS		(× 10b)
DOR AU HEL	×××		 113.353 12.821	4.925	105.532 7.930	122.073 20.374	141	309 5	0.186 2.726 0.390

PART CLASS: GENERATOR

TYPE: HOT GAS

				FAILURE RATE/106 HOURS	/106 HOURS				
	APPLI	APPL ICATION	(e	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	MIN OF STATE	OPERATING HOURS
ENV I RONMENT	ł	MIL, COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	and and and and	(× 10¢)
DOR	×		1 :	0.781			1	0	1.173

PART CLASS: GENERATOR

TYPE: MOTOR/GENERATOR

		•							
				FAILURE RATE/10 HOURS	/10 HOURS				
					1	147700000000000000000000000000000000000			SOLICH SMITTERS
	1004	NOT LATE ON		60% UPPER		604 CONFIDENCE INTERVAL	NUMBER OF	NUMBER FAILED	Cachina and the second
TNEWFORM			(<	SINGLE-SIDED	{	03001	RECORDS		(x 10°)
	¥	MIL. COML.		CONFIDENCE	LOWER	OFFER			
								•	000
							~	_	4.333
	;	_		010			~ ~) '	77.
202	× 	_	1	011.0	(1)	1 75 057	_	4	0.144
L C	. >		27 778	;	766.61	40.00	٠,) 010 0
	< -		0////		707 73	1 360 259	_	7	710.0
Nav	>		166.66/	;;	161.10	2000		c	0.351
5	< _	_	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	012 0	 	1111	-	>	
197 (×	_	()	0.10.2					
2	< _	_							

PART CLASS: GENERATOR

TYPE: TURBINE/GENERATOR

				EATTINE BATE/10 6 HOURS	/ 10 HOURS				
,									
	1 100 4	APPLICATION	<	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER FAILED	OPERATING HOURS
IN HANGE ! DAG	J		*	SINGLE-SIDED	l	0300:	RECORDS		(× 10°)
ENVINORMEN	MIL. COML.	COMC.		CONFIDENCE	LOWER	UFFER			
	_						•	C	۵۲۵ م
			0,00		10 422	70.488	-	7	
2	×	_	38.035	!	77.16		-	220	0 539
ś			710 000		597 420	656.639	~	000	
u U	×		050.21/	! !		212 61	,-	42	4.025
		>	11 925	ţ	10.462	010.61	٠,	0	1 288
2	_	<	01011		11 561	17 840		07	1.300
CHC	>		14.409		100.11	21.01	•		
SHS -	`` د 	_			-				

PART CLASS: GYROSCOPE

TYPE: DIRECTIONAL

		N Q I CH	,	90
		OPFRATING HOLLD	(x 10 ⁶)	8.766
			NUMBER FAILED	4505 51
		NIMRED OF	RECORDS	36
		60% CONFIDENCE INTERYAL	UPPER	520.469 341.075
	/106 HOURS		LOWER	507.464 264.296
	FAILURE RATE/106 HOURS	60% UPPER	CONFIDENCE	
		(4	:	513.917 300.000
•		APPLICATION	COML.	
			Mil,	××
		ENVIRONMENT		AI HEL

PART CLASS: GYROSCOPE

TYPE: GENERAL

				FAILURE RATE/10 ⁶ HOURS	:/10 ⁶ HOURS				
ENVIRONMENT	APPLI	APPLICATION	(4	604 UPPER	60% CONFIDENCE INTERYAL	ACE INTERVAL	a de		
	Mir,	COML.	•	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	OFERALING HOURS
DOR	×		0.247		0 220	1 267	-	120	10000
SAT	×		3.503	:	1.425	7.571	- ო	2	0.571

PART CLASS: GYROSCOPE

TYPE: RATE INTEGRATING

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
Tunanio di Vina	APPL!	APPL I CAT 10N	«	604 UPPER	60% CONFIDENCE INTERVAL	INTERVAL	NUMBER OF	03:143	OPERATING HOURS
VIRONDENI	HIL,	COML.	٤	CONFIDENCE	LOWER	UPPER	RECORDS	מסעפבע נאורכם	(x 10 ⁶)
DOR	×		0.409		0.368	0.454	15	73	178.654
SAT	×		!	5.295	!			0	0.173
GRM	×		31.051	;	29, 530	32.664	4	298	9.597
AI	×		352.023	;	347.857	356.248		5073	14.411
AI		×	4.167	1,1	1.695	9.006	2	2	0.480
AIF	×		288.156	1	272.286	305.103	r-4	236	0.819
五	×		75.000	!	53.643	104.630		6	0.120
SUB	×		70.919	,	68.468	73.474	1	597	8 118
MIS	×		541.667	!	451.157	651.686		792	ე 8

PART CLASS: HEATER

TYPE: ELECTRIC, GENERAL

				FAILURE RATE/106 HOURS	/106 HOURS				
Fu Banda I Aug	~	APPLICATION	(60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	d d d d d d d d d d d d d d d d d d d	OPERATING HOURS
THE PROPERTY	MIL,	COML.	4	CONFIDENCE	LOWER	UPPER	RECORDS	NORBER CALLED	(x 10 ⁶)
	;							,	
SAT	× 		0.450	1	0.089	1.369	m		12.7.7
GRF	× 		2.286		1.313	3.864	c	4	1.750
GRM	×		-	4.468	1		1	0	0.205
ď		× —	-	1.454		! !		0	0.630
AIT		×	17.738		15.352	20.532	8	40	2.255
HEL	×		50.000		25.520	92.621	,- 1	m	090.0
SUB	× 		7.595	-	3.876	14.069	7	е	0.395
					,		•		

PART CLASS: HEATER

TYPE: ELECTRIC, SPACE

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
	L	APPLICATION	6	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	000000000000000000000000000000000000000	OPERATING HOURS
ENVIRONMENT	I	MIL, COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	MUMBER FAILED	(x 10 ⁶)
GRF	×		1.157		0.883	1.517	4	13	11.239

PART CLASS: HEATER

TYPE: GENERAL

		_							
				FAILURE RATE/10 6 HOURS	/106 HOURS				
TAN TO CAME		APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF	NUMBER OF	OPERATING HOURS
	MIL,	COML.	•	CONFIDENCE	LOWER	UPPER	RECORDS	NORBER CALLED	(x 106)
DOR	×			0.268			3	0	3.416

PART CLASS: HEAT EXCHANGER

TYPE: GENERAL

				FAILURE RATE/106 HOURS	/106 HOURS				
THE WIND OF THE S		APPL ICATION	<i>(-</i>	60% UPPE	60% CONFIDENCE INTERVAL	VCE INTERVAL	NUMBER OF	4	OPERATING HOURS
ENV I RONDEN I	MIL,	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER FAILED	(× 10 ⁶)
GRF	×				0.461	1.675		m	3.318
GRM	×			!	2.525	5.888	1	9	1.548
A	×			-	1.074	1.160		505	452.369
ΑΩ	×			1	2.152	3.903	2	11	3.795
AUT		×	5.344		3.618	7.840	,1	7	1.310
AUF	×			:	17.058	28.029	٣	15	0.685
SHS	×		;	1.667	!	!	~	0	0.549
SUB	×			4.447	1 1		7	0	0.206
	_								

PART CLASS: HOSE

TYPE: FITTINGS, GENERAL

				FATILIDE DATE/106 HOLDS	A 10 6 HOURS					
					cyco c. l					
FNVIBONMENT	APPL	APPLICATION	(-	60% UPPER	60% CONFIDE	60% CONFIDENCE INTERVAL	30 d 3d Milin		OPEDATING HOUSE	
	MIL,	COML.	•	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ₆)	
DOR	×		0.461	: :	0.265	0.780	,	V	N 671	
Z C	>		100		000		J (r 1	7.0.0	
ם פוצות	<		13.035	1 2 1	8.82/	19.126	2	_	0.537	_
⋖	× _		19.048	!	10.938	32.199	2	4	0.210	_
AU	×		1118.928	: :	1082,369	1156,945	-	899	0.597	_
HEL	×		3.898	1 2	3,311	4.597	2	32	8.210	
	1									_

PART CLASS: HOSE

TYPE: HYDRAULIC

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS			ļ	
FWEWNOOLONS	APPLI	APPLICATION	(60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	4	OPERATING HOURS
	MIL,	MIL, COML.	•	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
900	>		1 613		1 002	1 613	ç	7	0.50
2	<		1.013		1.032	1.013	7	,	P. 0.00
GRF	×			1.105	1			0	0.829
GRM	×		0.240		0.189	0.305	2	16	992.99
4	×		115.830	-	97.821	137.433	-1	30	0.259
Ή	×		32.941		30.789	35.267		168	5.100
					4				

PART CLASS: LAMP

TYPE: INCANDESCENT

				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
Live Strategy of Strategy		APPLICATION	æ	60% UPPER	60% CONFIDE	60% CONFIDENCE INTERVAL	1000000		
CAN I ROMPEN	_	MIL, COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF	×		:	900.0	1		-	0	141.538
GRF		×	0.906	: :	0.590	1.376	2	9	6.623
GRM	×		10.171	:	4.137	21.985	-	5	0.196
GRM		×	:	0.054	1	1	^	0	16 900
SHS	~		18.624	!	18.029	19.241		700	37,586

PART CLASS: LAMP

TYPE: LED

		•							
				FAILURE RATE/10 6 HOURS	1106 HOURS				
	APPLI	APPLICATION	6	604 UPPER	601 CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER FAILED	OPERATING HOURS
ENVIRONMEN	HIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10°)
305		×	0.276	-	0.264	0,289	16	363	1312.882
5		:)	(C	1 010
GRF	×			0.480	:	:		>	016.1

PART CLASS: LAMP

TYPE: NEON

ENVIRONMENT APPLICATION A 604 UPPER 604 CONFIDENCE INTERVAL NUMBER OF RAILED OPERATING HOURS CONFIDENCE LOWER UPPER RECORDS SHS X 0.489 0.407 0.588 1 26 53,215										
MENT APPLICATION A SINGLE-SIDED CONFIDENCE INTERVAL NUMBER OF NUMBER FAILED CONFIDENCE LOWER UPPER RECORDS X 0.489 0.407 0.588 1 26			-,		FAILURE RATE	/10 HOURS				
MIL, COML. COMFIDENCE LOWER UPPER RECORDS MILL COMPLET A COMPLET <th></th> <th>L.</th> <th>CATION</th> <th>æ</th> <th>604 UPPER</th> <th></th> <th>ICE INTERVAL</th> <th>NUMBER OF</th> <th>M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</th> <th>OPERATING HOURS</th>		L.	CATION	æ	604 UPPER		ICE INTERVAL	NUMBER OF	M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	OPERATING HOURS
x 0.489 0.407 0.588 1 26	ENVIRONMENT	<u> </u>	COML.	<	CONFIDENCE	ļ	UPPER	RECORDS		(× 10 ⁶)
	SHS	×		0.489	-	0.407	0.588	1	26	53,215

PART CLASS: MANIFOLD

TYPE: GENERAL

		•					-		
!				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
	APPLI	APPLICATION	(*	60% UPPER	601 CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF	NIMBER FALLED	OPERATING HOURS
ENVINCENTER	HIL,	COML.	c	CONFIDENCE	LOWER	UPPER	RECORDS	מסומר וסומר	(× 10¢)
DOR	×		0.613		0.249	1.325	3	2	3.263
GRM	× 		7.390	1	7.047	7.753	2	332	44.924
A	×		27.568	-	26.469	28.721	-	449	16.287
AU	×				140.278	165.541	-	115	0.755
AUT		×	•	1	28.052	35.837		55	1.736
HEL	×		75.194		68.719	82.364	-	97	1.290
_	_	_							

PART CLASS: MECHANICAL DEVICE

TYPE: CLUTCH

			FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
APPLICATION	17 10N	(-	60% UPPER	60% CONFIDENCE INTERYAL	ICE INTERVAL			OPERATING HOURS
MIL, COME.	COML.	۲	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF SHS X	×	0.594	1.708	0.571	0.619		478 0	804.347 0.536

PART CLASS: MECHANICAL DEVICE

TYPE: COUPLING

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
TAN COLON		APPLICATION	(~	604 UPPER	1	60% CONFIDENCE INTERVAL	NUMBER OF	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	OPERATING HOURS
		MIL, COML.	ζ .	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF	×		5.341		3.067	9.028	1	4	0.748

PART CLASS: MECHANICAL DEVICE

TYPE: GEAR

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
And Service of Anna S	_	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERYAL	UCE INTERYAL			OPERATING HOURS
ENVINONMENT	MIL,	COML.	ς .	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF	× 		-	0.175	:	1	4	0	5.230
GRF		×	0.169	;	0.129	0.218	-	14	83.067
SHS	×		0.073		0.016	0.170	2	 4	13.641
				_					

PART CLASS: MECHANICAL DEVICE

TYPE: GEAR ASSEMBLY

		-		FAILURE RATE/10 HOURS	/106 HOURS					
									V 00000	
	100	NOT TATE OF	•	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER OF NUMBER FAILED	OFERALING 1100.00	
THE WAY			*	SINGLE-SIDED		03000	RECORDS			
ENVIKUNDEN	1	1707		CONFIDENCE	LOWER	Uryek				
					40 515	65.578	e	16	0.310	
SHS	× 		51.503	1						
				,						

PART CLASS: MECHANICAL DEVICE

TYPE: GEAR SHAFT

	OPERATING HOURS	(x 10°)	0,148	
	NUMBER FAILED		1	
	NUMBER OF	RECORDS	1	
	ICE INTERVAL	UPPER	20.464	
/106 HOURS	601 CONFIDENCE INTERVAL	LOWER	1.333	
FAILURE RATE/106 HOURS	601 UPPER	CONFIDENCE	;	
	(«	6.730	
1	APPLICATION	MII COML.		
	1 laav		×	
		ENVIRONMENT	SUB	

PART CLASS: MECHANICAL DEVICE

TYPE: JOY STICK ASSEMBLY

PART CLASS: MECHANICAL DEVICE

TYPE: MECHANISM, POWER TRANSMITTAL

				FAILURE RATE/106 HOURS	/106 HOURS				
		APPLICATION	6	60% UPPER	60% CONFIDENCE INTERYAL	VCE INTERVAL	NIMBED OF		OPERATING HOURS
ENV I KUNTEN	HIL,	COML.	ζ	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
						·			
DOR	× —		0.112	:	0.022	0.341	2	,	8.929
SAT	×		;	6.836	;	;	2	0	0.134
GRF	×		1.670	1 1	1.379	2.024	7	24	14.370
GRF		×	54.054	-	42.480	68.709	2	16	0.296
GRM	×		11.528	!	10.927	12.168	2	263	22.814
GRM		×	41.622	!	39.374	43.864	4	272	6.535
Æ	×		10.987	:	10.842	11.135	6	4057	369.258
AUT	٠	×	9.256	!	8.653	9.608	6	169	18.258
AUF	×		1.960	:	1.125	3.313	-	4	2.041
HEL	×		986.655	:	961.652	1012.428	8	1109	1.124
SHS	×		1.776	1	0.352	5.401	-	7	0.563

PART CLASS: MECHANICAL DEVICE

TYPE: SPEED DRIVE

		-							
				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
	APPL I	APPL I CAT 10N	«	601 UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	NUMBER OF NUMBER CALLED	OPERATT: HOURS
ENT LAUNTEN	MIL,	MIL, COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER LAILED	(x 10 ₆)
AUT		×	131.108		120.511	142.772	2	110	6:830

PART CLASS: MECHANICAL DEVICE

TYPE: SPRING

					֡				
		L		FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
APPLICATION	APPL 10	AT 10N	¢	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER OF	G 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	OPERATING HOURS
1 RONNEN	ř.	MIL, COML.		CONFIDENCE	LOWER	UPPER	RECORDS	מסשפט נשורכם	(x 10 ⁶)
GRF	×		f 1	5.551	}		1	0	0.165
AIF	×		1	1.406	1	1 .	2	0	0.651

PART CLASS: MISCELLANEOUS

TYPE: COIL, COOLING-CHILLED WATER

				FAILURE RATE/10 6 HOURS	/106 HOURS				
	APPLI	APPLICATION	¢	60% UPPER	60 CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NIM BER	OPERATING HOURS
ENVIRONMENT MIL, COML.	# F .	41r, COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10p)
GRF	×		1.005	;	0.621	1.597	2	2	4.976

PART CLASS: MISCELLANEOUS

TYPE: ENGINE

		•							
				FAILURE RATE/10 6 HOURS	/ 10 6 HOURS				
	APPLI	APPLICATION	«	601 UPPER	60% CONFIDENCE INTERVAL	VCE INTERVAL	NUMBER OF	MIMBED FALLED	OPERATING HOURS
ENVIRONAEN	یّ	COML.	£	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10 ^b)
DOR	×		0.898		0.608	1.318	1	7	7.792
GRF		×	577.397		563.952	591.222		1313	2.274

PART CLASS: MISCELLANEOUS

TYPE: RF CABLE ASSEMBLY

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
Y INSTRUCTIONS	APPLI	APPLICATION	«	60% UPPER		60% CONFIDENCE INTERVAL	NIMBER OF	MINRED OF	OPERATING HOURS
	HIL,	M1L, COML.	4	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF	X			0.545			1	0	1.681

PART CLASS: MISCELLANEOUS

TYPE: SAFE AND ARM DEVICE

		FAILURE RATE/10 HOURS	/10 HOURS				
APPLICATION APPLICATION	(60% UPPER	60% CONFIDENCE INTERYAL	HERYAL			OPERATING HOUSE
MIL, COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10g)
DOR X	0.482		0.414	0.563	2	36	74.706

PART CLASS: MOTOR

TIPE: FRACTIONAL H.P.

		<u> </u>	(x 10¢)		5.744	102.788	24.366	3.313
		<u> </u>	NUMBER FAILED		19	154	184	16
		90 000	RECORDS		2	 -	-	-
		60% CONFIDENCE INTERYAL	UPPER		4.120	1.609	8.059	6.148
	/10 ⁶ HOURS	60% CONFIDER	LOWER		2.660	1.396	7.080	3.799
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		1 1		!	
		(~	ς		3.30/	1.498	7.552	4.829
ı		APPLICATION	COML.			×		
		APPL	MIL,	,	~		×	×
		THEMPOOLVER		L	SKT	GRF	GRM	AI

t

PART CLASS: MOTOR

TYPE: FULL H.P.

	ļ			FAILURE RATE/10 ⁶ HOURS	710 HOURS				
ENVIRONMENT	APPLI	APPLICATION	(4	60% UPPER		60% CONFIDENCE INTERYAL	NUMBER OF	4	OPERATING HOURS
	7 L.	COML.		CONFIDENCE	LOWER	upper	RECORDS	NUMBER FAILED	(x 10 ⁶)
aOu	\ \ -		0 400		000	1 517			700 0
Ś	< 		664.0		660.0	/16.1	_	-	4.004
GRF	×		0.913	!	0.773	1.080	12	31	33.967
GRM	×		4.238		3.468	5.191	2	22	5.190

PART CLASS: MOTOR

TYPE: GENERAL, A.C.

			FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS					
A TANAMAN AND AND AND AND AND AND AND AND AND A	APPLICATION	ION	60% UPPER	1 1	601 CONFIDENCE INTERVAL	A STANTIN		OPERATING HOURS	
I	MIL, COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)	
									, ,
GRF	×	1.235	;	0.883	1.723	2	6	7.288	
SHS		10.243	1	8.882	11.833	œ	41	4.000	
SUB		2.247	!	0.914	4.820	2	2	0.890	_

PART CLASS: MOTOR

TYPE: GENERAL, D.C.

				gorden gerranen	941				
				TAILVAE RAIC	ל זוט יון				
		APPLICATION	6	60% UPPER	60% CONFIDENCE INTERYAL	VCE INTERVAL	NUMBER OF	03 1 4 3 G 3 8 7 1 1 1 4	OPERATING HOURS
ENVIKUNDEN	MIL,	COML.	•	CONFIDENCE	LOWER	UPPER	RECORDS	אסופרא ואורנט	(x 10 ⁶)
SAT	×		0.871	:	0.354	1.884	2	2	2.295
GRM	×		9.132	!	6.665	12.500	-	10	1.095
AU	×		187.387	:	171.807	204.581	, - 1	104	0.555
AUT		×	157.209	-	152.103	162.518	2	9/9	4.300
HEL	×		190.909	-	155.387	235.027	-	21	0.110
SUB	× _		31,384	:	25,679	38.434	2	22	0.701
		_							

PART CLASS: MOTOR

TYPE: INDUCTION

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
THEMNOOTH	APPL	APPLICATION	٠	60\$ UPPER	60% CONFIDENCE INTERVAL	VCE INTERVAL	NIMBER OF	NIMBER OF	OPERATING HOURS
ENVIRONIEN	M1L.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	
GRF	×		:	14.774	!	!	_	0	0.062

PART CLASS: MOTOR

TYPE: PM

ENVIRONMENT APPLICATION APPLICATION SINGLE-SIDED CONFIDENCE LOWER UPPER HECORDS CAPERAT OPPER RECORDS (X CAPERAT T O OPERAT OPPER T O OPERAT OPPER T O OPPERAT O O O OPPERAT O O O O O O O O O O OPPERAT O O O O O O O O O O O O O			•							
APPLICATION Application Altr. Coml. X 608 CONFIDENCE INTERVAL NUMBER OF NUMBER FAILED CONFIDENCE LOWER UPPER RECORDS X 4.202 1 0 0					FAILURE RATE	/10 ⁶ HOURS				
M1L. COML. X 4.202 1 0			CATION	(~	60% UPPER		UCE INTERVAL	NUMBER OF	NIMBER FAILED	OPERATING HOURS
- 4.202	ENVIKUNMEN)		COML.	۲	CONFIDENCE	i	UPPER	RECORDS		(× 10 ⁶)
- 4.202						•				
	GRF	×		<u>;</u>	4.202	1	6	_	0	0.218

PART CLASS: MOTOR

TYPE: SENSOR

		•							
				FAILURE RATE/106 HOURS	/106 HOURS				
	L	APPLICATION	¢	604 UPPER		60% CONFIDENCE INTERYAL	NUMBER OF	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	OPERATING HOURS
ENY SKUNDEN	31.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	מלומר ועובר	(× 106)
						-			
S.R.M	×				0.322	1.713	_	2	2.524
0	:	×	8 152	!	4.161	15,101	-	3	0.368
נוֹנוֹ	>	<		0000					2 357
SES	< -	_	 	0.303	1	-	-	>	
SUB	×		10.487		10.112	10.879	~	557	53.114

PART CLASS: MOTOR

TYPE: SOLENOID

		•							
			 - -	FAILURE RATE/10 6 HOURS	/10 ⁶ HOURS				
		APPLICATION	«	601 UPPER	601 CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	MIMBED FATIFO	OPERATING HOURS
ENY I KONTEN		MIL, COML.	ť	CONFIDENCE	LOWER	UPPER	RECORDS		(4 10 ⁶)
DOR	×			2.379	1	-		0	0.385
SAT	×		*	0.034	1	{ 	-	0	26.975

PART CLASS: MOTOR

TYPE: STEP

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
A TO SPINOUS AND S		APPL ICAT ION	æ	60% UPPER	60% CONFIDENCE INTERVAL	ACE INTERVAL	NUMBER OF	MED	OPERATING HOURS
ENVIRONMENT	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	RECORDS NOMBER LAILED	(x 10 ⁶)
GRF		×	1.378		0.568	2.956	, -	2	1.451

PART CLASS: MOTOR

TYPE: TORQUE

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HQURS				
TANAMANA		APPLICATION	(4	601 UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL		03 13 4 3 0 0 0 0 Milk	OPERATING HOURS
		MIL, COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
					,				
DOR.	×		;	0.220	:	1 1		0	4.158
GRM	×			4.183	}	:	-	0	0.219
SUB	×	_	;	0.425	:	!		0	2.153

PART CLASS: PUMP

TYPE: BOILER FEED

		4							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
FNVIPONMENT	APPL I	APPLICATION	×.	60% UPPER		60% CONFIDENCE INTERVAL	NIMBED OF		OPERATING HOLDS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(y01 x)
GRF	×		0.422	•	0.381	0.467	_	78	185.000

PART CLASS: PUMP

TYPE: CENTRIFUGAL

			•	FAILURE RATE/106 HOURS	/ 10 6 HOURS			ı	
F MO TO ONLEW T		APPL 1 CAT 10N	«	601 UPPER	601 CONFIDENCE INTERYAL	ICE INTERVAL	NUMBER OF	03 11 4 3 0 0 0 31 11 11	OPERATING HOURS
	¥1 L.	COML.		CONFIDENCE	LCWER	UPPER	RECORDS	מחוקב בטורבה	(× 106)
GRF	×		12.013	:	10.176	14.211	ري د	31	2.580
GRF		×	5.777		4.500	7.408	m	15	2.596
SHS	×		298.122		282.288	314.980	7	254	0.852

PART CLASS: PUMP

TYPE: COOLANT

				FAILURE RATE/106 HOURS	/10 ⁶ HOURS			1	;
FNCTRONEFNT		APPLICATION	(-	60% UPPER		60% CONFIDENCE INTERYAL	NUMBER OF	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	OPERATING HOURS
	<u> </u>	COML.	c	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10e)
⋖	×		657,251	* 6.7	648.831		1	4328	585 9
AUT		×			122,563	195.215	. ~	17	0.110

PART CLASS: PUMP

TYPE: ELECTRIC MOTOR DRIVEN

		4								
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS			:		
FNVIBONENT		APPLICATION	K	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF		OPERATING HOURS	
		M14, COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 106)	
		:				,				
∢		×		!!!	5.576	8.530	4	20	2.903	_
AIT		×		- 1	354.168	424.080	_	86	0.253	_
AU	×		354.817		341.710	368.516	m	523	1.474	
AUT		×		!	1.981	30.407	 1	~	0.100	_
HEL	×			!	3.963	60.815	H		0.050	
,	,	_		_						_

PART CLASS: PUMP

TYPE: ENGINE DRIVEN

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
					ı				
		APPLICATION	4	601 UPPER	60% CONFIDENCE INTERVAL	ACE INTERVAL	NUMBER OF	NUMBER FAILED	OPERATING HOURS
ENV I RONHENT		MIL. COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS		(x 10.2)
			_			,	_	~	0 162
4		×	18,519		9.452	34.304	-) ·	000
ς .		< :			A19 10E	469 810	_	226	0.510
AIT		× -		1 1	410.133	010.001			0.13/
11.6	_	>			195.964	2/3.660	-	37	7
₩.		<				100 010	-	96	300
Ή	×		86.667	-	/2.185	104.270	→	2	
					_	_	1		

PART CLASS: PUMP

TYPE: FIXED DISPLACEMENT

				FAILURE RATE/10 6 HOURS	/10 ⁶ HOURS				
		70.100		ANA LIPPER	60% CONFIDENCE INTERVAL	CE INTERVAL	4		OPERATING HOURS
THENT	`	201	(<	SINGLE-SIDED	1		NUMBER OF	NUMBER FAILED	1901
ENT INCOME.		MIL, COML.	:	CONFIDENCE	LOWER	UPPER	RECORDS		(17)
						-			
900	>		0 250	•	0 232	0.270	9	135	540.000
2	<		0.230	i i	300			-	0 683
GRF	×		1.464	:	0.230	704.4	-1	7	20.0

PART CLASS: PUMP

TYPE: FUEL

		•							
				FAILURE RATE/10 HOURS	/10 6 HOURS				
	لسا	APPLICATION	«	601 UPPER	601 CONFIDE	601 CONFIDENCE INTERYAL	NUMBER OF	A J A J A J A J A J A J A J A J A J A J	OPERATING HOURS
CNV I KOMPEN	H .	COMI.	<	CONFIDENCE	LOWER	UPPER	RECORDS	HORSER LAILED	(x 10°)
ava	>			0.057			,	c	16 1/10
200	<_			7			~ ``	>	0+1.01
GRF	×		176.471		149.034	209.383		30	0.170
GRM	×		6.683	:::	5.879	7.608	2	. 50	7.482
GRM		×	181.001	:	168.088	195.057	~	141	0.779
⋖	×		71.879		70.166	73.642	m	1253	17.432
A.	×		37.539	:	33.783	41.766	-	72	1.918
AUT		×	10.471	}	9.555	11.487	7	94	8.977
AUF	×		130.342		116.167	146,457	m	61	0.468
펖	×		334.821	1	305.005	371.668		75	0.224
				designation of the second	The same of the sa			-	

PART CLASS: PUMP

TYPE: GEROTER

		-							
		-		FAILURE RATE/10 HOURS	1106 HOURS				
	APPL 1	APPLICATION	¢	601 UPPER		601 CONFIDENCE INTERVAL	NUMBER OF	CA CLAR CORNEL	9
ENVIRONMEN! MIL.	H(L,	שורי כסאר.	(CONFIDENCE	LOWER.	UPPER	RECORDS	RECORDS NOTICE LATER	_ 1
A	×		18.286		14.384	23,283	2	16	0.875
AUF	×		30.525	;	25.323	36.873	7	25	0.819

PART CLASS: PUMP

TYPE: HYDRAULIC

		•							
				FAILURE RATE/106 HOURS	/10 6 HOURS				
	C.	NPPLICATION	6	60% UPPER	601 CONFIDENCE INTERYAL	4CE INTERVAL	NUMBER OF	0 4 4 0 0	OPERATING HOURS
ENVIRONMEN	HIL,	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	Monte Later	(× 10¢)
JOR JOR	×		0.178		0.155	0.204	15	43	242.136
GRF	×		1.675	-	1.036	2.662	,	2	2.985
RM	×		42.437		41.241	43.675	4	897	21.137
	×		573.711	*	565.297	582.275	, —1	3304	5.759
TIK		×	6.289	!	5.295	7.486	4	53	4.611
JO.	×		799.145		749.673	852.400	-	187	0.234
EL	×		395.022	*	377.544	413.448	4	365	0.924
	_					_			

PART CLASS: PUMP

TYPE: HYDRAULIC MOTOR DRIVEN

				FAILURE RATE/10 6 HOURS	/106 HOURS				
		APPLICATION	¢	601 UPPER	ļ	60% CONFIDENCE INTERVAL	NUMBER OF	A T	OPERATING HOURS
ENV I RONMENT	1	MIL, COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10¢)
									•
GRF		×	4.219	-	3.452	5.166	4	2	5.215
AUF	×		16.949	1	3.358	51.538	.	-	0.059
SUB	×		34.330	!	29.080	40.610	2	.31	0.903

PART CLASS: PUMP

TYPE: IMPELLER

	OPERATING HOURS	(x 10 ₆)	0.526
	3	RECORDS NOTICE OF THE P	0
	NUMBER OF	RECORDS	1
	60% CONFIDENCE INTERYAL	UPPER	
/106 HOURS		LOWER	
FALLURE RATE/106 HOURS	60% UPPER SINGLE-SIDED CONFIDENCE		1.741
	(*	c	
	APPLICATION	MIL. COML.	
	APPL		×
	Line State of the	ENVIRONMENT	GRF

PART CLASS: PUMP

TYPE: OIL

		•							
				FAILURE RATE/10 HOURS	/10 ⁶ HOURS				
	APPLI	APPLICATION	¢	601 UPPER	601 CONFIDEN	601 CONFIDENCE INTERYAL	NUMBER OF		OPERATING HOURS
CHY I KUMPEN	H L	COML.	ζ ,	CONFIDENCE	LOWER	UPPER	RECORDS	מקומר ישורה	(× 10¢)
							·	Ö	7
GRM		×	28.241	!!	23.108	34.586		7.7.	6.1/9
⋖	×		59.459	,	50.648	69.941	~	33	0.555
AIT		×	11.687	!	9.610	14.243		23	1.968
HEL	×		45.455	!	26.103	76.839	2	4	0.088
SHS	× 		78.975	!!!	71.183	87.732	-	74	0.937
	_	_			1				

PART CLASS: PUMP

TYPE: TURBINE DRIVEN

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
	•	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER OF	CB II V B CB WINN	OPERATING HOURS
ENVIKUMEN I		MIL. COML.	ξ.	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10 ⁶)
ΔĬΙ	×		78 189		69.391	88.236	1	25	0.729
S S	<	×	0.342	!	0.325	0.361		265	774.000
AUT		: ×	299.99	!	53.262	83.601		18	0.270

PART CLASS: PUMP

TYPE: VACUUM

		•		The same of the sa					
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
TWEMPOUND	APPL I	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	USTIVE GENTIN	OPERATING HOURS
ENVIRONMENT	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NOTIBER FRIEED	(× 10 ⁶)
GRF		×	27.027		9385	82.182	3	1	0.037
4	×		15.464	:	7.893	28.646	_	က	0.194

PART CLASS: PUMP

TYPE: VARIABLE DISPLACEMENT

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
TNAMPOLINE		IPPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	INTERVAL	NUMBER OF	3 4 3 G 3 G 3 G 3 G 3 G 3 G 3 G 3 G 3 G	OPERALING HOURS
		41L. COML.		CONFIDENCE	LOWER	UPPER		NOMBER INTELL	(x 10g)
DOR	×		0.200		.0.162	0.248	2	20	100.000

PART CLASS: PUMP

TYPE: WATER

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL		MIN	OPERATING HOURS
ENV I RONMENT		MIL. COME.		SINGLE-SIDED CONFIDENCE	LOWER	UPPER	RECORDS		(× 10¢)
No		>	0 3/12	1	0.325	0.361		265	774.000
GKM		<	0.342		20.01	00.00	-	۵۲	0.270
AUT		×	/99.99	1 1	207.56	03.001	-	0.7	2 13 12

PART CLASS: REGULATOR

TYPE: FUEL

		•							
				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
	APPLI	APPL ICATION	¢	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	CHIMBED SALIED	OPERATING HOURS
INV I RONMENT	MIL.	COML.	< 	SINGLE -SIDED CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER TRIEF	(x 10 ⁶)
Ail	×		178.807	; ;	174.107	183.657	1	1031	5.766
된	×		136.213	1	118.118	157.363	2	41	0.301

PART CLASS: REGULATOR

TYPE: GENERAL

				FAILURE RATE/10 ⁶ HOURS					
	APPL 1	APPL 1CATION	(-	60% UPPER	60% CONFIDENCE INTERVAL	GE INTERVAL	NUMBER OF	NUMBER OF NUMBER FAILT	OFFRATING HOURS
INC BONWING	Α1 L.	MIL. COML.	<	CONFIDENCE	LOWER	UPPER	PECORDS		(× 10 ⁶)
A	N/A	N/A	4.072	 	2.908	5.656	က	6	2.210
					-				

PART CLASS: REGULATOR

TYPE: OXYGEN DEMAND

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
	_	APPL 1 CAT 1 ON	«	60% UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL	NUMBER OF	O LO MINIS	OPERATING HOUPS
ENVIKUNMENI	Щ.	MIL. COML.	ζ.	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10 ⁶)
æ	×		736.274		714.541	758.788	1	818	1.111

PART CLASS: REGULATOR

TYPE: PRESSURE

	Ī				_		_	_		
		OPERATING HOURS	(× 10 ⁶)		1.011	0.350	20.946	8.437	30.018	0.470
		MUNICIPALITY	NUMBER FAILED	•	5		51	19	2495	56
		NUMBER OF	RECORDS	,	2	2	13	3	23	.
		NCE INTERVAL	UPPER		111	8.688	2.768	2.805	84.549	66.555
/10 ⁶ HOURS		60% CONFIDENCE INTERVAL	LOWER	,	! !	0.566	2.145	1.811	81.714	46.076
FAILURE RATE/106 HOURS		60% UPPER	CONFIDENCE	0000	0.306	:		1 1	!	1
		() []	2.857	2.435	2.525	83.117	55.319
		APPL ICATION	COML.						N/A	
		APPL I	MIL.	;	×	×	×	×	N/A	×
		THEMMENT	ENVIRONMENT	000	ž	SAT	GRF	GRM	A	딮

PART CLASS: REGULATOR

TYPE: TENSION

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs		. !		
FNVIDONMENT	APPL 1	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NIMBER OF	NUMBER OF	OPFRATING HOURS
	Mil.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER LAILED	(× 106)
А	×		5.221		4.381	6.235		28	5.363

PART CLASS: REGULATOR

TYPE: THERMOSTAT

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
TWINDUIN		APPL I CAT I UN	«	60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	NI-MB FD OF		OPEDATING HOURS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(301 X)
SAT	×		3.484		.0.690	10.595	,-	,I	0.287
GRF	×		4.858		4.369	5.410	2	71	14.613
GRF		×	17.386		14.535	20.838	-	27	1.553
A	×		233.746		230.308	237.245	-	3286	14.058
AIT		×	22.562		21.248	23.971	က	211	9.352

PART CLASS: REGULATOR

TYPE: VOLTAGE

	<u></u>	UPPER RECORDS NUMBER FAILED	3.336
FAILURE RATE/10 ⁶ HOURS	60% UPPER 60% CON	CONF I DENCE LOWER	2.188
	< ←	<u>, </u>	2.998
	APPLICATION	COML.	_
	APPLI	MIL.	×
	FNVIRONMENT		GRF

PART CLASS: RELAY

TYPE: ARMATURE

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
FNVIDONMENT		APPL I CAT 10N	«	60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	ac drawing		
Name of the last	M1L.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF	×		0 375		30E U.	0.432		Ç.	
3	<		0000		0.350	C-432		43	114./02
GRF		×	0.015	1	0.003	0.044	2	_	68.807
GRM	×		1.229	!	0.243	3, 736	,	, -	0.814
GRM		×	-	0.271			۱ ۳-	٠ .	3 380
AIT	×		0.054	: :	0.044	0.066	٠,	2.5	392.000
SHS	×		0.915		0.843	0.995	۸ ر	116	126 716
SUB	×		1.030	!	1.020	1.041	ا	6953	6750 051
) i	1.) . 1	•		100.00

PART CLASS: RELAY

TYPE: COAXIAL

		•								
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS					
ENVIRONMENT	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NIMBER OF		OPERATING	
	MIL.	COML.	:	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)	
GRF	×			3.923			1	0	0.233	

PART CLASS: RELAY

TYPE: CRYSTAL CAN

							-		
				FAILURE RATE/10 ⁶ HOURS	/110 ⁶ ноикs				
10000	APPL 1	APPL I CAT I ON	«	60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER OF	L	OPERATING HOURS
W J KUNMEN I	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
DOR	×			0.021		1 - ;	F	0	43.469
GRF	×		0.156		0.105	0.228	2	7	44.954
GRF		×	0.082	1	0.068	0.100	11	23	279.663
AIT	×		7.407	, .	6.256	8.789	2	30	4.050
SHS	×	_		0.920		-	1	0	0.996

PART CLASS: RELAY

TYPE: CURRENT SENSITIVE

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
FNVIDONMENT	APPL I	APPL I CAT I ON	(4	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF		OPERATING HOUPS
	M1L.	41L. COML.		CONF 1 DENCE	LOWER	UPPER	PECORDS	NUMBER TAILED	(x 106)
GRF		×	1	1.285			- -1	0	0.713

PART CLASS: RELAY

TYPE: GENERAL

		OPERATING HOLIDS	(x 10e)	799.900	231.331	142.656	350.882	0.786	20.212	0.075	1.420	59.003	1788 524
			NUMBER FAILED	19	က	27	029	0	83	0	44	22	632
		NUMBER OF NUMBER F	RECORDS	10	6	13	15	9	6	<u></u>	М	6	വ
		608 CONFIDENCE INTERVAL	UPPER	0:030	0.024	0.227	1.974	-	4.533	!	35.604	1.054	0.366
	/10 ⁶ HOURS	60% CONFIDER	LOWER	0.019	0.007	0.158	1.847	[]	3.724	1	27.014	0.825	0.341
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		-	:		1.165		12.189		:	;
		(ς .	0.024	0.013	•	1.909	1	4.106	;	•	0.932	
•		APPLICATION	COML.				×		×		_		
		APPL	MIL.	×	×	×		×		×	×	×	×
		FNVIDONMENT	- Control	DOR	SAT	GRF	GRF	GRM	AIT	AIF	HEL	SHS	SUB

PART CLASS: RELAY

TYPE: HIGH VOLTAGE

		7							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
TWENNOGIANS	APPL 1	APPL 1 CAT 1 ON	(60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	NUMBER OF		OPERATING HOURS
	MIL.	11L. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
GRF	×			0.545	, -	-	1	O	1891
GRF		×	0.551	-) () (0.109	1.674	၂ က	•	1.816

PARY CLASS: RELAY

TYPE: LATCHING

	FAILURE RATE/10 HOURS	60% CONFIDENCE INTERVAL	CONFIDENCE LOWER UPPER	0.016 0.247 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.027 0.017 0.041 6 6 225.862	0.393 4 2	0.008 0.130 1 1 1	7.328 3 0	0.342 \ 0.330 0.354 1 1 601 1759.452
	FAILURE RATE/10								_	~~
1		APPLICATION	COML.				×			
		بـــا	MIL.	×	×	× —		× 	×	×
		ENSWING I VIVE		DOR	SAT	GRF	GRF	AIT	AIF	SUB

PART CLASS: RELAY

TYPE: MOTOR DRIVEN

		-								
				FAILURE RATE/10 HOURS	./10 HOURS					
ENVIRONMENT		APPL ICAT ION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NO OF		Carry Curry Addido	-
	MIL.	11L. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	$(x 10^6)$	_
GRF		×	22.22		15.048	32.605		7	0.315	

PART CLASS: RELAY

TYPE: POWER

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				!
THEFT	APPL 1	APPLICATION	4	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NIMRFR OF		OPERATING HOURS
L. M. C. M. C. M.	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(× 10¢)
GRF	×		1.013	}	0.686	1.486	1	7	6.912
GRF		×	1.930		1.505	2.480	9	15	7.770
GRM	×		7.009	-	4.566	10.647	2	9	0.856
¥	×		9.502	:	8.360	10.818	-	20	5.262
SHS	×		0.198	:	0.101	0.367	4	က	15.139

PART CLASS: RELAY

TYPE: REED

		_					
			(× 10e)	82 675	20.609	48.042	1.250
		<u>L</u>	NUMBER FAILED	16	18	69	0
		NIMBER OF	RECORDS	,	7	9	-
		6 HOURS 60% CONFIDENCE INTERVAL		0.246	1.095	1.602	† !
	/10 ⁶ HOURS		LOWER	0.152	0.698	1.289	
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		! !		0.733
		«		0.194	0.873	1.436	!
•		APPL I CAT I ON	COMIL.		×	×	
		APPL 1	MIL.	X			×
		THEMMOSTANS		GRF	GRF	SUB	SUB

PART CLASS: RELAY

TYPE: THERMAL

	FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL NUMBER OF NUMBER OF	LOWER UPPER RECORDS			8.096 20.800 1 5	0.177 0.941 1 2 4.596	5.081 77.968 1 1	0.304 1.613 1 2	7,445 15,223 1 8
,		NUMBER	RECORD			,		_	-	_
		ICE INTERVAL	UPPER			20.800	0.941	77.968	1.613	15.223
	/10 ⁶ ноикs			,	-	8.096	0.177	5.081	0.304	7.445
	FAILURE RATE/1	60% UPPER	CONFIDENCE		2.000		;			
		«	«		-	13.089	0.435	25.641	0.746	10,667
•		APPL I CAT 10N	COML.				×			
		APPL 1	MIL.		×	×		×	×	×
			MENI					AIT		

PART CLASS: RELAY

TYPE: TIME DELAY

		_	Γ			_			
!	OPERATING HOURS	(x 10 ₆)		7.019	0.480	0.471	0.864	4.950	0.469
	4	NUMBER FAILED		11	0	2	23	m	0
	NIMBER OF	RECORPS		4	-1	-	-1	2	-1
	VCE INTERVAL	UPPER		2.110	;	9.179	32.442	1.196	l 1
/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	,	1.164	!	1.727	21.889	0.862	: 1
FAILURE RATE/10 ⁶ HOURS	608 UPPER	CONFIDENCE		-	1.908	-		1	1.953
	(4	ξ.		1.567	!	4.246	26.620	1.014	!
	APPLICATION	COML.			×				
		MIL.		×		×	×	×	×
	The state of the s	CINT I KOMPENI		GRF	GRF	GRM	AIT	SHS	MIS

PART CLASS: ROTARY JOINT

TYPE: MICROWAVE

FAILURE RATE/10 ⁶ HOURS	60% UPPER 60% CONFIDENCE INTERVAL NUMBER OF	CONFIDENCE LOWER UPPER RECORDS	0 401	162 343.875 45
			1	393,162
	APPL I CAT I ON	MIL. COML.	×	<
	ENV I BONMENT		GRE	

PART CLASS: SENSOR

TYPE: GENERAL

		•								
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs					
England of Ann	APPL I CAT	CATION	(60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NEIMBED OF		OPERATING HOURS	
V I KURMEN	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(X 10 ⁶)	
DOR	×		0.545		.0.398	0.746	1	10	18.340	
GRF	×				2.545	3.496	6	34	11.409	
GRF		×	909.09	!	24.654	131.003	-	2	0.033	
¥	×		•	!	82.367	96.203	2	130	1.461	
AIT		×			83.786	95.133	2	191	2.140	
AU	×				651.597	693.921		747	1.111	
AUT		×	50.575	:	44.091	58.113		44	0.870	
HEL	×			!	66.039	89.047	Ŋ	38	0.496	

PART CLASS: SHOCK ABSORBER

TYPE: GENERAL

	OPERATING HOURS	(x 10 ₆)	1.658	0.803	1.260
	NUMBER OF ALLIANDED EALIED		0	0	22
	NUMBER OF	RECORDS	1	~-	
	ICE INTERVAL	UPPER		!	21.383
/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	,	:	14.287
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	0,552	1.141	1
	(-	•	:	;	17.460
	APPL ICATION	COML.		- 1.	
	APPL	M1L.	×	×	×
	TMOMMONTANA		GRF	GRM	HEL

PART CLASS: SHOCK ABSORBER

TYPE: GENERAL, MOUNT

0.328 1.742 1 2 3.623 10.665 1 4 2.777 14.755 2 2 102.581 169.017 1 15	APPL I CAT FON		«	FAILURE RATE/10 ⁶ HOURS 60% UPPER 60% CON	/10 ⁶ HOURS 6u% CONFIDENCE INTERVAL	UCE INTERVAL	NUMBER OF	NUMBER FAILED	OPERATING HOURS
0.328 3.623 2.777 102.581	COML.			CONF I DENCE	LOWER	UPPER	RECORDS		<u> </u>
3.623 10.665 1 4 2.777 14.755 2 2 102.581 169.017 1 15	0	0			,	1 740	-	c	601 6
3.623 10.665 1 4 2.777 14.755 2 2 102.581 169.017 1 15	0.800	0.800		:	0.328	1./42	-	7	704.7
2.777 14.755 2 2 102.581 169.017 1 15	6.309	6.309			3.623	10.665	-	7	0.634
102.581 169.017 1 15	6.826			<i>!</i> ! !	2.777	14.755	2	5	0.293
	131.579	_:		!!!	102.581	169.017	-1	15	0.114

PART CLASS: SHOCK ABSORBER

TYPE: ISOLATOR

		•							
				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
FNVIDONMENT		APPL ICATION	Ų.	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF		OPERATING HOUPS
	1	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	RECORDS NUMBER FAILED	(× 10 ⁶)
GRF	×		1.206		0.239	3.666	1	1	0.829

PART CLASS SLIP RING ASSEMBLY

TYPE: GENERAL

		_		_							
		20100 SHILL A G 100	$(x \cdot 10^6)$		8.316	0.408	0.437	2.065	5.261	6.168	0.977
			NUMBER FALLED		0	0	0	103	0	0	39
		o de la constitución de la const	RECORDS		2	2		1	2	1	-4
		UCE INTERVAL	UPPER		!	!	!	54.480	1	1	46.299
	/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER		-	1	:	45.712	1 1		34.480
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		0.110	2.245	2.096		0.174	0.148	
		«	٤.		;		 	49.879	i i	1	39.918
•		APPL ICATION	COML.								
		APPL 1	MIL.		×	×	×	×	×	×	×
		TINDMINOGENIA	LINE I KOMPENY		DOR	SAT	GRF	GRM	¥	SHS	SUB

PART CLASS: SOCKET

TYPE: DUAL-IN-LINE (PER PIN)

		•							
				FAILURE RATE/10 ⁶ HOURS	7106 HOURS				
NVIRONMENT	APPLI	APPLICATION	(-	601 UPPER	li	60% CONFIDENCE INTERVAL	NUMBER OF		OPERATING HOURS
	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(× 106)
GRF		×	95000.0		0.00012	0.0017	1	1	1801.200
SHS	×		! !	0.005	Į !	:		0	200.500

PART CLASS: SOCKET

TYPE: HIGH POWER TUBE

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
THEMMONT	APPLI	APPLICATION	(60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF		OPERATING HOURS
LINETROMITERAL	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ₆)
GRF	×			0.477			1	0	1.921

PART CLASS: SOCKET

TYPE: LAMP

ENVIRONMENT APPLICATION MIL. APPLICATION COML. APPLICATION SINGLE-SIDED CONFIDENCE INTERVAL NUMBER FAILED CONFIDENCE INTERVAL NUMBER FAILED (X 10 ⁵) NUMBER FAILED (X 10 ⁵) OPPERATING HOURS (X 10 ⁵) GRF X X 0.007 1 0 124.942 SHS X X 0.012 1 0 76.218							The second name of the least of			
APLICATION APPER SINGLE-SIDED 60% UPPER CONFIDENCE INTERVAL NUMBER OF NUMBER FAILED MIL. COML. CONFIDENCE LOMER UPPER RECORDS NUMBER FAILED X 0.007 1 0 X 0.012 1 0					FAILURE RATE	/10 ⁶ HOURS				
X	FNVIBONMENT	APPLI	CATION	«	60% UPPER		ICE INTERVAL	NIMBED OF		OPEDATING HOUSE
x 0.007 1 0 1 x 0.012 1 0		MIL.	COML.		CONFIDENCE		UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
x 0.012 1 0	Cor	>			200	•		-	C	0.00
X 0.012 1 0	20	<		, ,	700.0	;	1 1 1	-	0	124.942
	SHS	×		<i>i</i>	0.012	;	! ! ;	, 4	0	76.218

PART CLASS: SOCKET

TYPE: RELAY

	NUMBER OF	NUMBER TAILED	1 0 6.343
/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	0.144
	«		
	APPLICATION	COML.	
		MIL.	×
	TNYIDOMMENT		SHS

PART CLASS: SOLENOID

TYPE: GENERAL

		FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
I CAT ION	«	60% UPPER	60% CONFIDER	NCE INTERVAL	u 0		Section
COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	$(\times 10^6)$
		0.300	. :	: .	-	C	3.057
	0.715	;	0.142	2.174	2	, ,	1.399
	65.637	:	63.372	67.997	က	599	9.126
×	18.031	! !	13.761	23.646	,	13	0.721
	!	25.641	16.703	38.950	-	9	0.234
	MIL. COML. X X X X X X X X X X X X X X X	0 0 18 18	0.715 65.637 18.031	Single-side Single-side CONFIDENCE 0.300 0.715 65.637 18.031 18.031 18.031	60% UPPER 60% CONFIDENCE II CONFIDENCE 0.300 0.715 65.637 18.031 25.641 16.703 31	Single-Sided Lower Ovper Confidence Interval Confidence Ovper Confidence Confidence Interval Confidence In	Song Le-Sided Confidence Interval Number of Number Confidence Interval Number of Number Confidence Interval Number of Number Of Single-Sided Confidence Interval Number of Numbe

PART CLASS: SPRINKLER HEAD

TYPE: GENERAL

			UPPER RECORDS (X 106)	0.724 3 35 56.573
٠	/10 HOURS	60% CONFI	LOWER	0.530
	FAILURE RATE/10 HOURS	608 UPPER	CONFIDENCE	1
		æ	S	0.619
		APPLICATION	11L. COML.	
		APPL	MIL.	×
		ENVIRONMENT		GRF

PART CLASS: SWITCH

TYPE: CENTRIFUGAL

		<u> </u>		SAUN PATE/10 HOURS	1106 HOURS				
				ו שוראשר שאיבי					
+	100	NO TANK	•	60% UPPER	601 CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER FAILED	OPERATING HOURS
			(~	SINGLE-SIDED F			RECORDS		(x 10.7)
M I KONNENS	MIL. COML.	COMC.	;	CONFIDENCE	LOWER	UPPER			
	1	1				•			
		-		_	1	141	,	4	2 217
-	-		1 000		1 178	7.747	v	5	1
285	~ <		1.000	1 1 1) 1	000	-	c	יייי
	_	,	טאר טכ		12 516	56.509	-	7	2000
AIT	~	~	30.703		010:01	0.00	-	237	0.671
	 >	_	252 204		333, 793	3/3.930	-1	100	
~ Y	~ <		1000	_	100	001	_	22	662.0
ī	 >		73 759	-	60.209	30.100	-	1	
חבר	_ <		10000						

TYPE: COAXIAL

	NUMBER OF NUMBER FAILED OFFRATING HOURS	_		100 81	2 4 14.U31	2/2 /	C+0.+ 7 7 7		0.00.0	7	
	CE INTERVAL		Uryek		0 482	70.	1500	10000	1	!	רכ
110 ⁵ HOURS	 60% CONFIDENCE INTERVAL		LOWER		, A 3.C.A.	- tot.o	175	27.0		111	
FAILURE RATE/10 ⁵ HOURS	50% UPPER SINGLE-SIDED CONFIDENCE		CONFIDENCE					-	.000	18.283	
	•	(<			1	0.285		0.431		1	
<u> </u>	AOD! ICATION		COML.			_	_	×	:	_	
	1004		MIL.			>	<			>	<
		ENVIDONMENT	EN TOTAL COLUMN			700		ינסט		711	

PART CLASS: SWITCH

TYPE: Dual-In-Line (DIP)

	NIMBER OPERATING		0.507	
-		RECORDS	2	
	60% CONFIDENCE INTERVAL	UPPER	:	1
/10 ⁶ ноияs	ı	LOWER	1 1	
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	1.807	
	«	<		
L		COML.		
	APPL 1CAT 16	MIL. COML.	×	· ·
		ENVIRONMENT	305	5

TYPE: FLOW

		•							
				FAILURE RATE/10 ⁶ HOURS	110 ⁶ MOURS				
FNVIDONMENT	APPLI	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	INTERVAL		4	OPERATING HOURS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	
GRF	×		4.492		4.023	5.024	5	99	14.691
SES SES	××		2.542	1.839	1 721	3 718	F-1 F-	01	0.498
	:		3.0.3		44	2:1:0	-		40/17

PART CLASS: SWITCH

TYPE: GENERAL

		OPERATING HOUPS	NUMBER FAILED (x 10 ⁶)	0 44.949	4 7.880	23 11.581	1 7.778	3.952	1081 10.075	3 0.251	322 1.808	0 5.297	2 3.952
		NIMBER OF	-	5	5	6	4		- 5		-	9	_
		ICE INTERVAL	UPPER	1	0.858	2.420	0.391	1.094	110.135	21.992	186.975	;	1.094
	/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER		0.292	1,633	0.025	0.206	104.541	6.113	169.706		0.206
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE	0.020	:	-	!	;	1	1	-	0.173	
		Œ.			0.508	1.986	0.129	0.506	107.295	11.976	178.097	-	0.506
ı		APPL I CAT I ON	COML.				×	×	×				
		APPL I	MIL.	×	×	×				×	×	×	×
		TUSHNOOLVINS	ENVIRONMENT	DOR	SAT	GRF	GRF	ΑI	AIT	AIF	HEL	SHS	SUB

PART CLASS: SWITCH

TYPE: HUMIDITY

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS					
	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	a and a series	OPERATING HOURS	
ENV I PONMENT	M. I.	MIL. COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER LATERY	(x 10p)	
GRF	×		16.775		9.633	28,358	-	4	0.238	
		brack brack								

PART CLASS:SWITCH

TYPE: INERTIAL

		•					-		
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
ENDANCOLAND		APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	UCE INTERVAL	NUMBER OF	du i vu dudomine	OPERATING HOURS
ENA I ROMAEN	_	MIL. COML.		CONFIDENCE	LOWER	UPPER		NUMBER TAILED	(x 10 ⁶)
DOR	×		0.066		.0.047	0.092	1	6	137.100

TYPE: KEY

		DPERATING HOURS	(x 10 ⁶)	2.589
		dO		9
			RECORDS	1
		CE INTERVAL	UPPER	3.514
9	10 HOURS	60% CONFIDENCE INTERVAL	LOWER	1.508
	FAILURE RAIE/10 HOURS	60% UPPER	CONFIDENCE	
		(4		2.317
<u></u>		APPLICATION	41L. COML.	×
		APPLI		
		FWVIDONMENT		GRF

PART CLASS: SWITCH

TYPE: LIQUID LEVEL

				The second secon					
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS			:	
	<u>بــــا</u>	APPLICATION	(60% UPPER	60% CONFINER	60% CONFIDENCE INTERVAL	NUMBER OF		OPERALING HOURS
ENVIRONMEN	MIL.	COME.	3	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(× 10¢)
GRF	×		5.277		3.029	8.839	2	4	0.758
₽.	×		285.714	1	116.224	617.586	П	2	0.007
AUT		×	!!	18.320	:	!	~	0	0.050
딮	×		46.512	! !	18.920	100.537	-	2	0.043

PART CLASS: SWITCH

TYPE: PENDANT-HOIST

		•					-		
				FAILURE RATE/10 6 HOURS	/10 ⁶ HOURS				
THE PROPERTY OF THE PROPERTY O	_	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL		20142	OPERATING HOURS
ENVIR MUNICIPAL		MIL. COML.	*	CONFIDENCE	LOWER	UPPER	RECORDS	MONDER FAILED	(× 10 ⁶)
GRF	×		6.155		3.142	11.402	1	3	0.487

TYPE: PRESSURE

		-							
	i			FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPL	APPLICATION	(60% UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NIMBER OF		OPERATING HOURS
ENY I KONDEN	MIL.	COML.	•	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
DOR	×			~	0.048	0.140	2	4	48.300
GRF	×			:	0.852	1.120		45	46.095
GRM	×			1	6.500	7.402	5	183	26.390
4	N/A	N/A			37.718	40.396	വ	631	16.167
Ŧ	×		95.028		86.334	104.716	2	86	0.905
SHS	×				18.021	28.286	-	18	0.798
SUB	×			:	3.747	11.031	7	4	0.613

PART CLASS: SWITCH

TYPE: PUSH BUTTON

		,		The second second second second					
				FAILURE RATE/10 ⁶ HOURS	(10 ⁶ HOURS				
	APPLI	APPLICATION	«	60% UPPER	608 CONFIDENCE INTERVAL	WCE INTERVAL	NUMBER OF	437343 6369111	OPERATING HOURS
ENVIKUMAENI	MIL.	COML.	4	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER TAILED	(X 10 ⁶)
DOR	×			1.519	***		1	0	0.603
GRF	×		0.144	1	0.101	0.206	28	∞	55,533
GRF		×	27.155	1	26.694	27.700	<u>ښ</u>	21102	777.089
GRM	N/A	N/A	1	0.226			ഹ	0	4.053
4	N/A	N/A	7.353	1	6.738	8.031	7	103	14.009
댍	×		;	0.712		•	1	0	1.286
SHS	×		0.448		0.398	0.506	2	57	127.097
SUB	×		0.078	!!!	0.053	0.114	က	^	90.228
			the second secon			The state of the last of the l			

PART CLASS: SWITCH

TYPE: REED

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
THE CONTRACTOR	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER OF	NIMBED FALLED	OPERATING INURS
TA TROUMENT	MIL.	COML.		CONF I DENCE	LOWER	UPPER	RECORDS		(× 10 ⁶)
DOR	×		1	0.950	!			0	0.964
SAT	×		;	2.018				0	0.908
GRF		×		0.001		: :	-1	0	1200.000
GRM		×	0.123	-	0.050	0.266	-1	2	16.252

PART CLASS: SWITCH

TYPE: ROTARY

			A STATE OF THE PERSON NAMED IN COLUMN NAMED IN						
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
		APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	OPFRATING HOURS
ENVIKUMEN	MIL.	COML.		CONF I DENCE	LOWER	UPPER	PECORDS	NUMBER 131.ED	(x 10 ₆)
SAT	×		0.418		0.083	1.272	1	-	2.391
GRF	×		0.691	1 - 1	0.610	0.785	15	52	75.242
GRM	×		;	9.347	-	;	∞	0	0.098
4	×		16.001	!	15.098	16.966	2	225	14.062
AI	×		37.313		21.428	63.076	2	4	0.107
AIT	×		:	0.205				0	4.460
AIT		×	131.579		102.581	169.017	2	15	0.114
HEL	×		21.739	;	8.843	46.990	2	2	0.092
SHS	×		1.465	{	1.329	1.616	4	84	57.344
SUB	×		2.406		2.685	3.000	17	29	24.955
							•		

PART CLASS: SWITCH

TYPE: SENSITIVE

				FAILURE RATE/10 ^b HOURS	/10 ^b HOURS				
		APPLICATION	6	60% UPPER	60% CONFIDE	60% CONFIDENCE INTERVAL	NUMBER OF	C. A. A. B. G. A.	OPERATING HOURS
ENVIKUMENI	MIL.	COML.	ζ.	CONFIDENCE	LOWER	UPPER	RECORDS	NORDER FAILED	(× 10 ⁶)
8	×		!	0.409		!	က	0	2.237
GRF	×		2.707		2.379	3.087	11	49	18.098
×	×		14.650		13,735	15.634		184	12.560
HEL	×		107.500	! !	93.558	123.738	~-	43	0.400
SHS	×		:	0.347			2	0	2.636
SUB	×		1.104	:	0.972	1.255	2	51	46.202

TYPE: SHAFT

			FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
THE PROPERTY OF THE PARTY OF TH	 APPLICATION	٠	604 UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	MIMBED FALLED	OPERATING HOURS
ENV I ROWNEN	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	TOTAL TOTAL	(× 10 ⁶)
GRF	×	0.236		0.053	0.709	1	1	4.229

PART CLASS: SWITCH

TYPE: SNAP SLIDE

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
		APPLICATION	¢	60% UPPER	\$0\$ CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER OF	O D T W D D D D D D D D D D D D D D D D D	OPERATING HOURS
ENVIRONMENT		MIL. COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	RECORDS NORDER FRIED	(x 10 ⁶)
GRM		×	1	0.271			1	0	3.380
SUB	×		0.216	1	0.170	0.275	-	16	74.050

PART CLASS: SWITCH

TYPE: STEPPING

				FAILURE RATE/106 HOURS	/106 HOURS				
	AFPLI	APPLICATION	(60% UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL		MIMBER FAILED	OPFRATING HOURS
ENV I RONMENT	¥	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS		(× 10°)
900	>		007	1	0 163	0.865		2	2.000
ج د د	<		20.4.0		201.0				
SUB	×		21.368	:	13.216	33.956	٠,	C	0.234
	_								

TYPE: THERMAL

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
THEMPTON	APPL I	APPL1CATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	Warres alonine	OPERATING HOUPS
CHAIR KOMPEN	MIL.	MIL. COML.		CONFIDENCE	LOWER	UPPEP		MOTIBLE I MILLEY	(4 10 ⁶)
GRF	×		0.389		0.158	0.841	2	2	5.140

PART CLASS: SWITCH

TYPE: THERMOSTAT

		•							
	i			FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
		APPLICATION	«	Sold UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	JU d'HWIN	4	OFFRATING HOUPS
CNV I KUMMENI	MIL.	COML.	ζ	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ₆)
DOR	×			0.170			4	0	5.382
GRF	×		1.784	; !	1.452	2.187	7	21	11.769
GRF		×	!!	2.462	:	-	4	0	0.372
GRM	×		:	0.862	:	! !	~	0	1.063
Ø	N/A	N/A	6.554	7	5.714	7.531	4	44	6.713
ÆL	×		41.284	*	29.528	57.595	2	6	0.218
SHS	×		0.599		0.505	0.713	2	29	48.381
SUB	×		1.099		0.744	1.612	4	7	6.370

PART CLASS: SWITCH

TYPE: THUMB WHEEL

				FAILURE RATE/10 HOURS	/10" HOURS				
FUVIDONMENT		APPLICATION	*	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	as i vs asamin	OPERATING HOURS
L W I N CONTROL		MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER CALLED	(× 10 ₆)
GRM	×			3,299			11	0	0.277
AIT		×	15.856	1	8.093	29.372	-	က	0.189

PART CLASS: SWITCH

TYPE: TOGGLE

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPLI	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF		OPERATING HOURS
ENVIKUNMENI	MIL.	COML.	ζ.	CONFIDENCE	LOWER	UPPER	RECORDS	MUMBER FAILLU	(× 10 ⁶)
DOR	×			0.907			1	0	1.010
GRF	×		0.270	!	0.254	0.292	19	163	598.769
GRM	×		0.243	;	0.054	0.720	9	-	4.166
⋖	×		7.194	!!	6.813	7.600	4	255	35.446
ΑI	×		29.732	1 1	19.369	45.164	9	9	0.201
HEL	×		18.605	:	12.985	26.552	-1	∞	0.430
SHS	×		0.553	!	0.495	0.619	16	99	119.306
SUB	×		0.041		0.032	0.051	18	18	443.176
		_			_			~	•

PART CLASS: SWITCH

TYPE: WAVE GUIDE

FAILURE RATE/10 ⁶ HOURS 60% UPPER SINGLE-SIDED 60% CONFIDENCE INTERVAL NUMBER OF RECORDS CONFIDENCE LOWER UPPER RECORDS 0.366 4.926 2 2.098 6.175 1			•							
APPLICATION Record to the proper confidence of the post of the					FAILURE RATE	/10 ⁶ HOURS			1	,
MIL. COML. CONFIDENCE LOWER UPFER RFCORDS X 1.643 0.366 4.926 2 X 3.653 2.098 6.175 1	FASHIOONME	,	CATION	«	60% UPPER		NCE INTERVAL	NUMBER OF		PERATING IBUDE
X 1.643 0.366 X 3.653 2.098	ENVIRON		COML.	4	CONFIDENCE		UPPER	RECORDS	NUMBER FAILTE	(× 10¢)
3,653 2,098	GRF	×		1 643		998 0	4 426	6	-	509
	GRM	×		3.653		2.098	6.175	, —	+ 4	1.095

PART CLASS: SYNCHRO

TYPE: DIFFERENTIAL

1			
	Sdrion SNIIVS doing	(x 10 ₆)	26.658
	d a riva a admine	Monber LATER	35
	MUMBER OF	RECORDS	2
	4CE INTERVAL	UPPER	1.537
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	1.124
	60% UPPER SINGLE-SIDED CONFIDENCE		l t
	«		1.313
	APPLICATION	COML.	
	APPLIC MIL.	MIL.	×
		ENVIKUMPENI	SUB

PART CLASS: SYNCHRO

TYPE: GENERAL

		SOLUTION ON LEGISLA	06)	306	0.953	360	060	175	001	8.506
		-		6.	C	0.0	<u>.</u>	0	_	8
			NUMBER FAILED	29	321	0	0	18	15	e e
,		NIMBTO OF	RECORDS	-1	<u></u>		, 1	,	, <u>-</u>	-
		60% CONFIDENCE INTERVAL	UPPER	4.997	353.648	1 1	1 1	128.984	192.679	0.653
	:/10 ⁶ HOURS	60% CONFIDE	LOWER	3.534	320,935	<u>;</u>	}	82.175	116.942	0,180
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		- 1	2.544	10.178		1 1	
		<⁴	•	4.198	336.831	:	1 1	102.857	150.000	0.353
		APPL ICATION	COML.			×	× -			
		APPL	MIL.	×	×			×	×	×
		TW3MMC01VN3		GRM	A	Α.	AUT	AUF	ÆL	SUB

PART CLASS: SYNCHRO

TYPE: RECEIVER, TRANSMITTER

		_							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
FNVIRONMFNT		APPLICATION	(4	60% UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL	TO GO SHITTING		Sonor Swittedado
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(40t ×)
Ø	×		0.649	;	0.129	1.975			1.540
ď		×	7.426	;	2.948	15.663		2	0.276

PART CLASS: SYNCHRO

TYPE: RESOLVER

				FAILURE RAFE/10 HOURS	/106 HOURS				
Long and the second	APPL I	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	MIMBED OF		OPERATING HOURS
ENVIRONMENT	MIL.	COML.	£	CONFIDENCE	LOWER	UPPER	RECORUS	NUMBER LAILED	(y01 x)
90R	×		0.135	-	0.055	0.291	m	2	14.858
GRF	×		;	2.398	1 3		1	0	0.382
4	×		9.032	1 -	7.802	10.476		39	4.318
K		×	3.378	1 1	1.940	5.711	2	4	1.184
SHS	×		55.556	1	22.599	120.086		2	0.036
SUB	×		1.986	1	1.899	2.066	7	348	175.215

PART CLASS: TANK

TYPE: FUEL CELL

				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
THEFT		APPLICATION	«	60% UPPER	60% CONFIDER	608 CONFIDENCE INTERVAL	NIMBER OF	2	OPERALING HOURS
ENVIKUMEN		MIL. COML.	٧	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILEL	(x 10 ⁶)
GRM	N/A	N/A	7.745		7.019	8.555	3	82	10.588
4	×		152.358	:	149.440	155.345	1	1938	12.720
HEL	×		108.824	!	93.600	126.762	,I	37	0.340

PART CLASS: TANK

TYPE: GENERAL

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
NO I DONMENT	APPL I	APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL		Ca - L w a da do print	OPERATING HOURS
NA I KOMPENI	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 106)
AUT HEL	×	×	5.000	6.887	0.991	15.204	11	0	0.133

PART CLASS: TANK

TYPE: OIL

		•								
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS					
LIVE STREET		APPLICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	TO GENERAL		OPERATING INCHES	
CNVINORMEN		MIL. COML.	ζ.	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)	
GRM	N/A	N/A N/A	•	;	2.510	6.449	2	2	1.232	
⋖	×		•		43.956	46.909	—	701	15.439	
AUT		×	•		12.533	17.051	2	36	2.465	
AUF	×		238.636		207.318	275.177		42	0.176	
HEL	×		159.322) 1	145.384	174.782	2	94	0.590	

PART CLASS: TANK

TYPE: PRESSURE VESSEL

		•							
				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
FNVIDOMMENT		APPLICATION	«	60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	NIMBER OF		OPFRATING HOURS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER FAILTU	(× 10e)
DOR	×		0.237		0.047	0.722	1	1	4.211
AU	N/A	N/A	•	-	43.871	62.974	ო	22	0.410
덮	×		260.000	:	198.427	340.972	1	13	0.050
			The state of the s	The state of the s					

PART CLASS: TANK

TIPE: STORAGE

60% UPPER 60% CONFIDENCE INTERVAL NUMBER OF NUMBER FAILED OFFRAT CONFIDENCE LOWER UPPER RECORDS	Hours
GRF X 1.616 1.094 2.370 1 / 4.333	33

PART CLASS: TIME-TOTALIZING METER

TYPE: COUNTERS

100,140,140,1							
MOSTANT MON		FAILURE RATE/10 6 HOURS	/10 ⁶ HOURS				
אויין פטווקבוין	(4	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	MED	OPFRATING HOURS
MIL. COML.		CONF IDENCE	LOWER	UPPER	RECORDS	RECORDS	(× 10°)
×	346.985		336.434	357.926		771	2.222

PART CLASS: TIME-TOTALIZING METER

TYPE: TIMER, ELECTRO-MECHANICAL

			FAILURE RATE/10 6 HOURS	/10 ⁶ HOURS				
	APPLICATION	(-	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NIMBER OF	O TOWN	OPERATING HOURS
	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(× 10 ⁶)
		•		35.650	51.108	2	27	0.633
		95.238		38.741	205.862	1	2	0.021
_		_		7.055	16.452		9	0.554
_	×	_	1-1	162.067	182.118	,I	225	1.310
		_		363.152	382.641		1075	2.884
_			!	302.407	365.115	-1	06	0.271

PART CLASS: TRANSDUCER

TYPE: FLUID FLOW

		_							
				FAILURE RATE/100 HOURS	/100 HOURS				
APPLICATION	APPL 1	CATION	«	60% UPPER	608 CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NUMBER OF MINGED FALLED	OPERATING HOURS
ENVIRONMENI	M14.	MIL. COML.	ζ	CONFIDENCE	LOWER	UPPER	RECORDS	White Alle	(901 X)
AUT	N/A N/A	N/A	194.836		176.689	215.800	2	83	0.426

PART CLASS: TRANSDUCER

TYPE: GENERAL

				FAILURE RATF/10 ⁶ HOURS	/10 ⁶ HOURS					
THEMMOSTAND		APPL I CAT 10N	(4	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF		OPERALING HINIBS	
CNY I RONINGN I	_	MIL. COML.	ζ .	CONFIDENCE	LOWER	UPPER	PECORDS	NUMBER FAILTU	(x 10 ⁶)	
TAO	>			001				C	i L	
	<	:		0.288	1 0	1 1	7	0	1.558	
∢		×	91.91/		87.06/	97.082	က	257	2.796	
H	×		100.000	-	87.031	115.105	-	43	0.430	

PART CLASS: TRANSDUCER

TYPE: MOTIONAL

		OPERATING HOURE	(x 10g)	1.274	0.059	0.574
			NUMBER FAILED	5	15	41
		NIMREP OF	PFCORDS	1	7	1
		ICE INTERVAL	UPPER	6.237	326.575	82.520
	/10 ⁶ ноикs	60% CONFIDENCE INTERVAL	LOWER	2.427	198.207	61.940
	FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE			!!!
		(4	4	3.925	254.237	71.429
•	APPL I CAT I ON		COML.			
		APPL	MIL.	×	×	×
		THEMMONTON	CHAINCHIEN	GRF	AUF	Ŧ

PART CLASS: TRANSDUCER

TYPE: PRESSURE

		•							
				FAILURE RATE/106 HOURS	/10 ⁶ HOURS				
TWENNOG I ANS		APPL I CAT 10N	(-	60% UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL	NIMBED OF		SQUEL SKITS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10e)
600	^		1 000						
Š	<u> </u>		1.998	1	1.147	3.378	 1	4	2.002
GRF	×		6.757	1 1	1.339	20.546	-		0.148
GRM	N/A	N/A	79.055		72.247	86.593	2	97	1 227
¥	×		151.815	:	146.046	158.200	2	506	3.333
AUT		×	54.106	;	51.611	56.743	ı m	336	6.210
HEL	×		154.622	;	140.948	169.805	S	92	0.595

PART CLASS: TRANSDUCER

TYPE: TACH GENERATOR

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
ENVIRONMENT	APPLI	APPLICATION	(4	60% UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NIMBER OF		OFFRATING HOURS
	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 106)
A	N/A	N/A	54.331		51,173	57.715	5	212	3 902
Æ	×		57.944	:	51.694	65.042	·	62	1.070

PART CLASS: TRANSDUCER

TYPE: TEMPERATURE

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
		APPLICATION	«	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	NEWBER FALLED	OPFRATING HOURS
NY I KOMMEN		MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS		(× 10 ⁶)
200	,		2 413		0 981	5.215		5	0.829
7 4 6	<	>	21.7		18 758	25 768	1	34	1.548
, SK	*	< \$	50.38		83 977	90.02	· 4	615	7.074
T	<u> </u>	۲ ک	00.30		710.72	073.02		C	1 270
HEL	×		95.392	!	070.70	070.60	7	2	•

PART CLASS: VALVE

TYPE: BALL

	G HOURS	رو)	2.447	7.723	169
	OPERATING HOURS	(901 X)	2.1	7.	3.4
	NEW PER LANGE		0	2	5
	NUMBER OF	RECORDS	~	2	2
	ICC INTERVAL	UPPER	;	1.029	2.290
/10 ⁶ ноикs	60% CONFIDENCE INTERVAL		!	0.400	0.891
FAILURE RATE/10 ⁶ HOURS	60% UPPER SINGLE-SIDED COMFIDENCE		0.374	;	
	<<		:	0.647	1.441
	APPLICATION	COML.			
ļ	APPL	MIL.	×	×	×
:		ENVIRONMEN	DOR	GRF	GRM

PART CLASS: VALVE

TYPE: BUTTERFLY

				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
		APPL I CAT I ON	¢	601 UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	MIMBED CALLER	OPERATING HOURS
ENVIRONMENT		MIL. COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	A STATE OF THE STA	(4 J0 L X)
GRF	×		1.316		1.052	1.651	5	18	13.675

PART CLASS: VALVE

TYPE: CHECK

				FAILURE RATE/10 6 HOURS	/10 ⁶ HOURS				•
	APPLI	APPLICATION	4	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER OF	CA 11 43 GROWING	OPERATING HOURS
ENVIKUNMEN	HIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	MUMBER INITED	(× 10 ₆)
90R	×		0.049		0.025	0.092	9	3	6.679
GRF	×		3.180	1 1	2.735	3.704	∞	37	11.636
GRM	×		!	2.385	-	:	_	0	0.384
4	N/A	N/A	27.288		26.852	27.288	ω	2776	101.729
呈	×		10.050	!!	6.547	15.267		9	0.597

PART CLASS: VALVE

TYPE: DIAPHRAGM

NVIRONMENT APPLICATION GRF X CONFIDENCE INTERVAL CONFIDENCE CONFIDENCE CONFIDENCE CONFIDENCE 1.975 3.481	NTERVAL NUMBER OF VECORDS 3.481 3	NUMBER FAILED 12 0	OPERATING HOURS (x 10 ⁶) 4.577 0.124
--	-----------------------------------	---------------------	---

PART CLASS: VALVE

TYPE: FUEL

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
	APPLI	APPL ICATION	«	60% UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	OS I VA GEOMINA	OPERATING HOURS
V I KONMEN	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER FALLED	(x 10 ⁶)
DOR	×		-	0.127	- (-		1	0	7.220
GRF	×		-	8.327	1	!!	-	0	0.110
An:	×		42.645	1	38.810	46.910	5	68	2.087
AUT	:	×		? !	2.487	3.762	7	21	6.872
AUF	×		24.450	!!!	19.787	30.271	-	50	0.818
HEL	×				16.271	86.462	-	2	0.050

PART CLASS: VALVE

TYPE: GATE

		•							
				FAILURE RATE/10 ⁶ HOURS	/106 HOURS				
		APPLICATION	¢	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	OPERATING HOURS
ENV I RONMENT		MIL. COML.	<	CONFIDENCE	LOWER	UPPER	RECORDS	NOMBER LANGE	(x 10 ⁶)
GRF	×		1.336	!	0.975	1.829	4	10	7.484
4	×		32.448	:	24.092	43.695		11	0.339
HEL	×		71.429	!!!	44.179	113.510	_	J.	0.070
							The same of the same of	The state of the s	

PART CLASS: VALVE

TYPE: GENERAL

		•							
				FAILURE RATE/106 HOURS	/106 HOURS				
The state of the s	APPL!	APPLICATION	«	601 UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NIMBEDOF		OPFRATING HOURS
THE ROBBER	H16.	COM.	£	CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(x 10 ⁶)
DOR	×			0.006		!	7	0	148.475
SAT	×			0.640	:	1	,1	0	1.432
GRF	×		1	0.175	;		5	0	5.248
GRF		×	15.121	;	13.463	17.008	2	09	3,968
GRM	×		14.423	[7.362	26.718	4	က	0.208
⋖	N/A	N/A	101.086	۲ ۱	100.154	378.907	80	8353	82.633
呈	×		98.804		93.205	104.793	2	223	2.257

PART CLASS: VALVE

TYPE: GLOBE

	OPERATING HOURS	(x 10 ⁶)	5.784	0.829
	NUMBER OF MUMBER EATTER	MOLIBER LATER O	1	0
	NUMBER OF	RECORDS	2	
	ICE INTERVAL	UPPER	0.526	1
/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.034	
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		1.104
	«	•	0.173	;
	APPL ICATION	MIL. COML.		
			×	×
	TURNOGIAM		GRF	GRM

PART CLASS: VALVE

TYPE: HYDRAULIC

				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPL	APPLICATION	4	60% UPPER	60% CONFIDENCE INTERYAL	ICE INTERVAL	NUMBER OF	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	OPERATING HOURS
ENVINCANEN I	HIL,	COML.	ξ	CONFIDENCE	LOWER	UPPER	RECORDS	מסופרא ניטורה	(x 10 ⁶)
3	Ŀ						1	,	
<u> </u>	×		0.002	-	0.001	0.015	_	1	208.651
GRF	×		-	9.253	{	!		0	0.099
GRM	×		7.302		6.320	8.452	2	40	5.478
AC	×		52.144	1 1	50.163	54.301	13	760	14.575
AUT		×	11.937	1	11.292	12.625	25	245	20.524
AUF	×		17.309	!	14.163	21.198	4	22	1.271
						_			

PART CLASS: VALVE

TYPE: NEEDLE

FAILURE RATE/10 ⁶ HOURS	APPLICATION . 60% UPPER 60% CONFIDENCE INTERVAL NUMBER OF MINER PATTER OFFRATING HOURS	MIL. COML. CONFIDENCE LOWER UPPER RECORDS	0.842 2.164 2 5	X 1.176 1.0 0.779
	PPLICATI	11.	×	×
	 	<u></u>		<u> </u>
		ENVIRONMEN	GRF	GRF

PART CLASS: VALVE

TYPE: OIL

	OPERATING HOURS	(× 10 ⁶)	2.488	0.152
	CULTVL GURNIN		9	5
	NUMBER OF	RECORDS	-1	1
	ICE INTERVAL	UPPER	3.663	52.274
/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	1.571	20.345
FAILURE RATE/10 ⁶ HOURS	60% UPPER	CONFIDENCE		
	«	<	2.412	32.895
	APPL I CAT I ON	MIL. COML.		
		1	×	×
		ENVIRONMEN	GRF	A

PART CLASS: VALVE

TYPE: PLUG

	i		FAILURE RATE/10 ⁶ HOURS	/10 ⁶ ноикs				
بـــا	APPL I CAT 10N	(-	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	NIMBER FALLED	OPFRATING HOURS
ENVIKONMENI MIL	MIL. COML.		CONFIDENCE	LOWER	UPPER	RECORDS		(x 10 ⁵)
GRFX		3.272		2.632	4.076	5	19	5.806

PART CLASS: VALVE

TYPE: PNEUMATIC

		•							
				FAILURE RATE/10 ⁶ HOURS	/10 ⁶ HOURS				
	APPL I	APPLICATION	<-	60% UPPER	608 CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER OF	GITTY BILLING	OPERATING HOURS
ENVIRONMENT	MIL.	COML.	<	CONFIDENCE	LOWER	UPPER	PFCURDS		(x 10 ⁶)
age	>		0.00		0.004	0.057	4	,	52.908
A B C	< ×		0.608	1	0.451	0.818	6		18.101
2	×		22,242		21,455	23.064	16	569	5.482
AIT	:	×	10.094	1	9.709	10.497	15	490	48.544
AUF	×	:	31.852	!!!	27.456	37.022	9	38	1.193

PART CLASS: VALVE

TYPE: RELIEF

		1		FAILURE RATE/10 ⁶ HOURS	/110 ⁶ HOURS				
	_	APPL I CAT 10N	«	60% UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NIMBER OF		OPERATING HOUPS
CNV I ROMPEN	MIL.	COML.		CONFIDENCE	LOWER	UPPER	RECORDS	NUMBER FAILED	(X 10 ⁶)
	_								
DOR	×		0.001	1 1	0.0003	0.004	8		713.891
GRF	×		1.586	!	1.2980	1.943	11	22	13.867
GRM	×		2.517	!	2,1040	3.016	4	27	10.729
GRM		×	0.868	: -	0.1720			_	1.152
V	×		26.796	1 1	26.1000	27.514	က	1056	39.409
ΑΩ	×		69.76	1	8,3210		2	33	3.378
AUT		×	9.207		7.3560	_	4	18	1.955
AUF	×		78.857		70,7970		ю	69	0.875
HEL	×		133.501	! !	122.5070	145.623	9	106	0.794

PART CLASS: VALVE

TYPE: SERVO

		OPERATING HOURS	(A 10 ⁶)	87.589	3.066	0.360
	!		NUMBER LAILE	16	485	6
	,	NIMIT P OF	PF CORDS	10	က	1
	:	/10 ⁶ HOURS 60% CONFIDENCE INTERVAL	UPPER	0.233	164.540	34.877
	FAILURE RATE/10 ⁶ HOURS		LOWER	0.144	152.118	17.881
		50% UPPER	COMFIDENCE	:		!!
		4		0.183	158.187	25.000
		APPLICATION	COML.		4/A N/A	
			MIL.	×	N/A	×
		THIS TO CHIME HIT	LIAN I KOMPEN	DOR	Ø	Æ

PART CLASS: VALVE

TYPE: SOLENOID

FALLIDE DETFIND MILES	ALLONE RAIL/10 HOURS		LOWER UPPER RECORDS AUGISTIC FAILTE	0.006 0.013 14 7	1.486 1.812 9 82 50.002	3.669 56.310 1 1 1	30.196 4 156	21.939 4 4 41	144.239 4 40
_		IMMBE	PFCC	14	6		4	4	_
		4F I DENCE INTERVAL	UPPER	0.013	1.812	56.310	30.196	21.939	144.239
Salion gui	10 HOORS	608 CONFIDER	LOWER	0.006	1.486	3.669	26.221	16.468	107.850
FATTO BOTTE	FAILURE RATE/	60% UPPER	CONFIDENCE		!!	2 2			;
		<		0.009	1.640	18.519	28.128	18.990	124.611
	APPLICATION	COML.					×		
		APPLI	MIL.	×	×	×	×		×
		This I doning NAT	ENVIXONMENT	DOR	GRF	GRM	A	AUT	HEL

PART CLASS: VALVE

TYPE: WATER

				FAILURE RATE/10 6 HOURS	/In ⁶ HOURS					
T N Y I DOWNER WIT	_]	APPL ICATION	«	603 UPPER	60% CONFIDENCE INTERVAL	4CE INTERVAL	NUMBER OF	NUMBER OF	OFF BALTIES Two Per	
	MIL.	COML.	'	CONFIDENCE	LOWER	N 3 d d n	RECORDS	NUMBER LAILED	(x 10b)	
GRF	×		1.895		1.630	2.208	4	37	19.551	

NONELECTRONIC PARTS RELIABILITY DATA

SECTION 2

NONELECTRONIC PARTS DETAILED DATA

Section 2

NONELECTRONIC PARTS DETAILED DATA

The detailed data entries presented in this section are arranged in alphabetical order by major family class and alphabetically by type within each family class. The environmental codes described on page 5 are utilized in this section.

Failure rate estimates are not presented for those entries having zero failures and less than 0.5×10^6 hours. The user of this document who wishes to derive the 60% upper single-sided confidence limit estimate for the zero failure case may do so by dividing the value 0.916 by the operating hours provided for that entry.

INDEX FOR DETAILED DATA

	Page
Actuator	125
Linear	125
Rotary	130
Battery	131
Carbon - Zinc	131
Lead Acid	132
Mercury	133
Nickel Cadmium	134
Bearing	135
Ball	135
Circuit Protection Device	136
Circuit Breaker	136
Molded Case Circuit Breaker	137
Power Switch Circuit Breaker	138
Undervoltage Circuit Breaker	139
Compressor	140
Air	140
Connector	141
Circular	141
Coaxial	148
Power	149
Printed Circuit Board	150
Rectangular	152
Controls and Instruments	157
Compass	157
Indicator	158

INDEX FOR DETAILED DATA (Cont'd)

	Page
Emergency Light	161
Stand-By	161
Emergency Power	162
General	162
Fan	163
General	163
Generator	164
General	164
Gyro	166
Rate Integrating	166
Heater	167
Electric	167
Mechanical Device	168
Gear Assembly	168
Power Transmittal	169
Motor	170
Full Horsepower	170
Solenoid	172
Pump	173
Centrifugal	173

INDEX FOR DETAILED DATA (Cont'd)

	Page
Regulator	174
Pressure	174
Thermostatic	176
Relay	177
Armature	177
Crystal Can	178
General Purpose	179
Latching	182
Power	183
Reed	184
Time Delay	185
Socket	186
Pin, DIP	186
Sprinkler Head	187
General	187
Switch	188
Centrifugal	188
Diaphragm	189
Flow	190
Humidity	191
Keyboard	192
Push Button	193
Reed	194
Rotary	195
Sensitive	196
Thermostat	197
Thumbwheel	198
Toggle	200

INDEX FOR DETAILED DATA (Cont'd)

	Page
Time-Totalizing Meter	202
Timer, Electro-Mechanical	202
Valve	203
General	203

PART CLASS: ACTUATOR

nee. Linear

				rAllitor D	ratition pate/106 monbs		_	
	CDEC ANIMORS				60% CONTIDENCE	NCF 181FBVA1		OPERALING
Ž.	PART NUMBER MANUFACTURER	CHARACTERISTICS	<<	SINGLE-SIDED	1		FAILED	HOURS (X 10 ⁶)
DOR		Hydraulic	0.222	-	0.127	0.375	4	18.028
DOR		Hydraulic	40.770	!!!	23.216	64.239	5	0.123
DOR		Hydraulic	19.027	i ! !	15.908	22.805	27	1.419
DOR		Hydraulic	!	0.030	:	!	0	31.000
DOR		Hydraulic	-	1.230	;	!	0	0.745
DOR		Hydraulic	8.302	1	5.795	11.848	∞	0.964
DOR		Hydraulic	; ; !	0.233	1 1	;	0	3.929
900		Hydraulic	0.832	:	0.514	1.322	2	6.012
DOR		Hydraulic	0.066		0.055	0.078	59	440,200
D0P		Hydraulic	:	0.727	! ! !	; ;	0	1.260
DOR		Hydraulic	!	0.339	1	(0	2.700
90g		Hydraulic	0.998	:	0.573	1.672	4	4.008
DOR		Hydraulic	1	0.033	(<u> </u>	0	27.040
DOR		Pneumatic	-	1.459	;	;	0	0.628
DOR		Pneumatic	0.063		0.048	0.082	13	207.100
DOP		Pneumatic	0.256	1	0.179	0.365	ω,	31,250

PART CLASS: ACTUATOR

TYPE: Linear (continued)

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
	SPEC NUMBER			60% UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
	MANUFACTURER	CHARACTERISTICS	<	CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
DOR		Pneumatic	;	1.458	:	;	0	0.628
GRF		Hydraulic	;	:	1 1 1	!	0	0.014
GRF		Pneumatic	3.2050*	:	0.635	9,746	_	0.312
GRF		Pneumatic	15.7480*	:	11.866	20.909	12	0.762
GRF		Hydraulic	15.2280*	:	7.773	28.210	т	0.197
GRF		Hydraulic Servo	125.4160	;	110.666	142.845	5	0.446
GRF		Pneumatic, 4 inch dia, 18 inch Stroke,25 PSI	1.206	;	0.497	2.586	2	1.659
GRF		Pneumatic, 4 inch dia, 18 inch Stroke,25 PSI	2.411	;	0.993	5.172	2	0.829
GRF		Pneumatic, 3 inch dia, 36 inch Stroke,125 PSI	9.500	:	4.459	11.500	23	2.421
GRF		Pneumatic, 3 inch dia, 36 inch Stroke,125 PSI	15.745*	;	11.856	20.810	12	0.762
GRM		Pneumatic, Piston Rolling Diaphragm	0.0015	i	0.001	0.002	00	6636.000
GRM		Hydraulic	368,421	:	249,480	540.558	7	0.019

*Actuation (cyc)

PART CLASS: ACTUATOR

TYPE: Linear (continued)

EAR PASE AL AUMSER PART LUNGER CHARACTERISTICS The Constitution of C					FAILURE	FAILURE RATE/10 ⁶ HOURS			
Hydraulic Conditions A Continue Co	27	SPEC NUMBER	4000	(60% UPPER		NCE INTERVAL	NUMBER	OPERATING
Hydraulic 50.459 37.464 67.948 11 Hydraulic 2.207 0.437 6.712 1 Hydraulic 826.087 664.439 1029.050 19 Electrical 209.009 192.560 227.068 116 Hydraulic 285.714 116.224 617.586 2 Hydraulic 149.948 5190.240 6065.905 129 Hydraulic 149.948 435.935 537.935 74 Hydraulic 97.087 435.935 537.935 74 Hydraulic 319.672 276.123 370.774 39 Hydraulic 500.887 201.921 274.707 36 Hydraulic 198.485 201.921 274.707 36 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 159.283 170.556 635		MANUFACTURER	CHAKACIEKISTICS	<	CONFIDENCE		UPPER	FAILED	A0055 Q 19 €)
Hydraulic 2.207 0.437 6.712 1 Hydraulic 826.087 664.439 1029.050 19 Electrical 209.009 192.560 227.068 116 Hydraulic 5608.696* 5190.240 6065.905 129 Hydraulic 149.948 435.935 537.935 74 Hydraulic 97.087 435.935 537.935 74 Hydraulic 97.087 276.123 370.774 39 Hydraulic 500.887 276.123 370.774 39 Hydraulic 500.887 201.921 274.707 36 Hydraulic 198.485 159.283 1170.556 635 Hydraulic 164.807 159.283 170.556 635	GRM		Hydraulic	50.459	1	37.464	67.948	Ξ	0.218
Hydraulic 209.009 192.560 227.068 116 Electrical 209.009 116.224 617.586 2 Hydraulic 5608.696* 5190.240 6065.905 129 Hydraulic 149.948 139.400 161.417 145 Hydraulic 97.087 435.935 537.935 74 Hydraulic 97.087 811.993 115.195 30 Hydraulic 319.672 276.123 370.774 39 Hydraulic 500.887 494.793 507.072 4798 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 159.283 7776 47.56	GRM		Hydraulic	2.207	;	0.437	6.712	_	0.453
Electrical 209.009 192.560 227.068 116 Electrical 285.714 116.224 617.586 2 Hydraulic 5608.696* 5190.240 6065.905 129 Hydraulic 149.948 139.400 161.417 145 Hydraulic 97.087 81.993 115.195 30 Hydraulic 500.887 276.123 370.774 39 Hydraulic 500.887 201.921 274.707 36 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.165 7776 47,56	GRM		Hydraulic	826.087	1	664.439	1029.050	19	0.023
Electrical 285.714 116.224 617.586 2 Hydraulic 5608.696* 5190.240 6065.905 129 Hydraulic 149.948 435.935 537.935 74 Hydraulic 97.087 276.123 370.774 39 Hydraulic 500.887 494.793 507.072 4798 Hydraulic 235.294 201.921 274.707 36 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635	Α		Electrical	509.009	† † †	192.560	227.068	911	0.555
Hydraulic 5608.696* 5190.240 6065.905 129 Hydraulic 483.660 435.935 537.935 74 Hydraulic 97.087 81.993 115.195 30 Hydraulic 500.887 494.793 507.072 4798 Hydraulic 235.294 201.921 274.707 36 Hydraulic 198.485 164.807 159.283 170.556 635 Hydraulic 0.163 159.283 170.556 635 47,56	¥		Electrical	285.714) 	116.224	617,586	2	0.007
Hydraulic 149,948 139,400 161,417 145 Hydraulic 97,087 435,935 537,935 74 Hydraulic 97,087 81,993 115,195 30 Hydraulic 500,887 276,123 370,774 39 Hydraulic 235,294 201,921 274,707 36 Hydraulic 198,485 183,790 214,529 131 Hydraulic 164,807 159,283 170,556 635 Hydraulic 0.163 0.165 7776 47,56	4		Hydraulic	\$608.696*	!	5190.240	6065.905	129	0.023
Hydraulic 483.660 435.935 537.935 74 Hydraulic 97.087 81.993 115.195 30 Hydraulic 500.887 276.123 370.774 39 Hydraulic 235.294 201.921 274.707 36 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.165 7776 47,56	A		Hydraulic	149.948	!	139.400	161.417	145	0.967
Hydraulic 97.087 81.993 115.195 30 Hydraulic 319.672 276.123 370.774 39 Hydraulic 500.887 494.793 507.072 4798 Hydraulic 235.294 201.921 274.707 36 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.165 7776 47,56	ď		Hydrualic	483.660	!	435,935	537.935	74	0.153
Hydraulic 319.672 276.123 370.774 39 Hydraulic 500.887 494.793 507.072 4798 Hydraulic 235.294 201.921 274.707 36 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.165 7776 47,56	4		Hydraulic	97.087	!	81.993	115,195	30	0.309
Hydraulic 500.887 494.793 507.072 4798 Hydraulic 235.294 201.921 274.707 36 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.165 7776 47,56	⋖		Hydraulic	319.672	!	276.123	370.774	39	0.122
Hydraulic 235.294 201.921 274.707 36 Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.165 7776 47,56	4		Hydraulic	500.887	-	494.793	507.072	4798	9.579
Hydraulic 198.485 183.790 214.529 131 Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.162 0.165 7776 47,56	A		Hydraulic	235.294	1 1	1201.921	274.707	36	0.153
Hydraulic 164.807 159.283 170.556 635 Hydraulic 0.163 0.162 0.165 7776 47,56	¥		Hydraelic	198.485	!	183.790	214.529	131	099.0
Hydraulic 0.163 0.162 0.165 7776	⋖		Hydraulic	164.807	1	159.283	170.556	635	3,853
	A		Hydraulic	0.163	!	0.162	0.165	9777	47,561.000

*Actuation (cyc)

PART CLASS: ACTUATOR

TYPE: Linear (continued)

SPEC NUMBER PART NUMBER MANUFACTURER AIT	JMBER							
	61631		(60% UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
AIT	TURER	CHARACIERISTICS	<	CONFIDENCE	LOWER	UPPER	FAILED	400KS (X 10 ⁶)
AUT		Electrical, Passenger Door	21.280	1	1	:	:	:
		Hydraulic Servo	498.335	į	484.298	512.854	868	1.802
AUT		Hydraulic Servo	56.454	!	54.334	58.672	506	8.963
AUT		Hydraulic	80.086	1	76.785	83.774	374	4.670
AUT		Mechanical Spoiler, Slot Control	43.480	;	\$!	:	;	;
AUT		Mechanical, Aileron/ Rudder	2.000	:	;	;) 6	;
AUT		Mechanical Driven	5.503	! !	4.991	6.076	83	15.082
AUT		Mechanical Driven	227.829	!	221.926	233.918	1061	4.657
AUT	<u> </u>	Electrical	40.291	!	38.131	42.594	249	6.180
AUT		Electrical	86.051	;	82.320	89.980	380	4.416
AUT		Hydraulic	23.445	:	22,780	24.133	988	37.790
AUT		Hydraulic	65.854	!	55.057	78.931	27	0.410
AUT		Pneumatic	227.829	:	221.926	233.918	1061	4.657
AUT		Pneumatic	71.605	:	63.617	80.715	58	0.810

PART CLASS: ACTUATOR

TYPE: Linear (continued)

SPEC NUMBER				FATLURE P	FATLUME MATE/10 ⁶ HOURS	10 ⁶ HOUPS 50% COMPLIDENCE INTERVAL		241 TA 9 190
STEC NUMBER CHARACTERISTICS MANUFACTURER	CHARACTERISTICS	\rightarrow	⟨<	ENT UNITE STAGEE - STOFF COMFIDENCE	LOWER	UPPER	NUMBER FA11ED	(X 105)
Hydraulic	Hydraulic		48.132	:	43.446	53,389	9/	1.579
Hydraulic	Hydraulic		0.110	:	0.108	0.113	1346	12,220.000
Hydraulic	Hydraulic		297.297	-	277.698	318.495	165	0.555
Hydraulic	Hydraulic		384.615	!	237.886	611.207	2	0.013
Hydraulic	Hydraulic		357.143	!	220.894	567.550	5	0.014
Hydraulic	Hydraulic		266.124	!	186.124	380.573	8	0.030
Hydraulic	Hydraulic		1120.482	!	1063.746	1180.750	279	0.249
Hydraulic	Hydraulic		146.154	!	133.436	160.253	95	0.650
Hydraulic	Hydraulic		15.217	!	10.305	22.327	7	0.460
Hydraulic	Hydraulic		300.000	1 1	214.570	418.521	6	0.030
Hydraulic Servo			103.542	!	93.461	114.853	92	0.734
Hydraulic Servo			200.000	!	130.287	303.806	9	0.030
Hydraulic	Hydraulic		10.707	!	6.622	17.014	2	0.467
		_						

PART CLASS: ACTUATOR

TYPE: Rotary

OPERATING HOURS (X 10⁶) 1.893 0.117 0 0 LOWER UPPER 1 ! ! FAILURE RATE/10 HOURS 60% UPPER SINGLE-SIDED CONFIDENCE 0.528 ! << CHARACTERISTICS Electrical Electrical SPEC NUMBER PART NUMBER MANUFACTURER AUT SUB EN

PART CLASS: BATTERY

TYPE: Carbon-Zinc

1							 	 	 	
	OPERATING	(X 10 ⁶)	6.640	8.348						
	NUMBER	ralirb	9	က	 	 				
	CE INTERVAL	UPPER	1.370	0.661						
FAILUKE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.588	0.184						
FAILURE BA	60% UPPER	CONFIDENCE	!	1 1 1						
	(4	<	0.904	0.359						
		CHAKAC IEKISTICS	15 Cell	30 Cell						
	SPEC NUMBER	MANUFACTURER								
	3		GRF	GRF		 				

PART CLASS: BATTERY

TYPE: Lead Acid

,				
	OPERATING	(X 106)	0.861	
	NUMBER	LAILED	F-1	
	CE INTERVAL	UPPER	3.486	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.259	
FAILURE RA	60% UPPER	CONFIDENCE	;	
	(<	1.162	
		CHAKALIERISTICS	3 Cell	
	SPEC NUMBER	MANUFACTURER		
	77.0		GRF	

PART CLASS: BATTERY

TYPE: Mercury

ı	_			<u> </u>				 		 		
	OPERATING	HOURS (X 10 ⁶)	0.361	0.361	0.172	0.853						
	NUMBER	FAILED	0	0	7	7		 · · · · · ·				
	CE INTERVAL	UPPER	;	-	59.674	3.518						
FAILURE RATE/10° HOURS	60% CONFIDENCE INTERVAL	LOWER	;	!	27.576	0.261						
FAILURE R	601 UPPER	CONFIDENCE		1	1	:		 	 	 		
	(;	!	40.793	1.173						
		CHAKACIEKISTICS	4 Cell	6 Cell	8 Ce11	9 Ce11						
	SPEC NUMBER	MANUFACTURER							 			
	, L		GRF	GRF	GRF	GRF	- ~- ~ ~ ~	 	-		· · · · · · · · · · · · · · · · · · ·	

PART CLASS: BATTERY

TYPE: Nickel Cadmium

PART NUMBER CHARACTERISTICS R. S. BAN LATER LOWER GON CONT TOWN LOWER ANALTER LATER					FAILURE R	FAILURE RATE/10 HOURS			
1 Ce 1		SPEC NUMBER		<	601 UPPER		NCE INTERVAL	NUMBER	OPERATING
Cell 0.0216 Cell 0.092 0.053 0.154 Cell 3.290 2.294 4.664 Cell Cell 0.596 0.454 0.783 Cell 2.219 2.059 2.437 Cell 2.471 1.265 4.546 Cell 0.0669 Cell 1.014 0.707 1.438 Cell 0.363 1.304 Cell Cell Cell Cell 0.363 1.304 Cell Cell Cell Cell Cell	j	MANUFACTURER	CHARACTERISTICS	۷ .	SINGLE -SIDED CONFIDENCE		UPPER	FAILED	HOURS (X 10 ⁶)
Cell 0.092 0.053 0.154 Cell 3.290 2.294 4.664 Cell Cell 0.596 0.454 0.783 Cell 2.219 2.059 2.437 Cell 2.471 1.265 4.546 Cell 0.0669 Cell 1.014 0.707 1.438 Cell 0.363 1.304 Cell			1 Cell	1	0.0216	i ! 1	!	0	42.398
Cell 3.290 2.294 4.664 Cell Cell 0.596 0.454 0.783 Cell 2.219 2.059 2.437 Cell 2.471 1.265 4.546 Cell 0.0669 Cell 1.014 0.707 1.438 Cell 0.363 1.304 Cell		,	_	0.092	1	0.053	0.154	4	43.465
Cell Cell 0.596 0.454 0.783 Cell 2.219 2.059 2.437 Cell 2.471 1.265 4.546 Cell 0.0669 Cell 1.014 0.707 1.438 Cell 0.363 1.304 Cell			_	3.290	;	2.294	4.664	∞	2.431
Cell 0.596 0.454 0.783 Cell 2.219 2.059 2.437 Cell 2.471 1.265 4.546 Cell 1.014 0.707 1.438 Cell 0.709 0.363 1.304 Cell 0.363 1.304			~	}	} !	:	1 1	0	0.143
Cell 2.219 2.059 2.437 Cell 2.471 1.265 4.546 Cell 0.0669 Cell 1.014 0.707 1.438 Cell 0.709 0.363 1.304 Cell 0.363 1.304			_	0.596	! !	0.454	0.783	13	21.806
Cell 2.471 1.265 4.546 Cell 0.0669 Cell 1.014 0.707 1.438 Cell 0.709 0.363 1.304 Cell 0.363 1.304			_	2.219		2.059	2.437	136	61.277
Cell 1.014 0.0669 Cell 1.014 0.707 1.438 Cell 0.709 0.363 1.304 Cell 0.363 1.304			_	2.471		1.265	4.546	m	1.214
Cell 1.014 0.707 1.438 Cell 0.709 0.363 1.304 Cell			_	!	0.0669	!	!	0	13.686
Cell 0.709 0.363 1.304 Cell			_	1.014	!	0.707	1.438	∞	7.886
Cell			_	0.709	!	0.363	1.304	m	4.233
			_	!	:	i i	i 1	0	0.114
									
				وداد الماد الم					

PART CLASS: BEARING

TYPE: Ball

		OPERATING	(X 10 ⁶)	3.313
		NUMBER	FAILED	16
		CE INTERVAL	UPPER	6.126
,	FALLURE RATE/10 HOURS	60% CONFIDENCE INTERVAL	LOWER	3.777
	FAILURE R	601 UPPER	CONFIDENCE	! !
		(-		4.830
		CHABACTEBICTICS	COURT EN 10.3	4800 RPM, Grease Lube,
		SPEC NUMBER	MANUFACTURER	
		AN 4		AI

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: Circuit Breaker

- 1

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: Molded Case Circuit Breaker

				FAILURE R	FAILURE RATE/10 ⁶ HOURS				
$\overline{}$	SPEC NUMBER		(60% UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	NUMBER	OPERATING	
_	PART NUMBER MANUFACTURER	CHARACTERISTICS	<	SINGLE - SIDED CONFIDENCE	1.OWER	UPPER	FALLED	HOUPS CX 1065	
GRF		1 Pole, 15-50A	0.311	1	0.069	0.943	1	3.211	
GRF		1 Pole, 15-50A	2.619	1	1.909	3.573	10	3.818	
GRF		2 Pole, 15-100A	1.886	1	1.228	2.860	9	3.182	
GRF		2 Pole, 15-100A	0.623	!	0.257	1.336	2	3.211	
GRF		3 Pole, 15-100A	!	0.840	;	:	0	1.090	
GRF		3 Pole, 15-100A	ł	0.862	-	!	0	1.063	
GRF		3 Pole, 15-100A	1.046	:	0.431	2.243	2	1.913	
GRF		3 Pole, 15-100A	1.344	:	0.554	2.883	5	1.488	
GRF		3 Pole, 15-100A	!	!	!!!	1	0	0.425	
GRF		3 Pole, 125-400A	2.854	!	0.636	8.562	~	0.350	
GRF		3 Pole, 125-400A	1.835	1	0.756	3.935	2	1.090	
GRF		3 Pole, 125-400A	0.856	:	0.438	1.575	က	3.504	
GRF		3 Pole, 70-225A	1	0.620	!	!	0	1.478	
GRF		3 Pole, 15-100A	-	1	* * * * * * * * * * * * * * * * * * * *	:	0	0.363	
				·					
					,				

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: Power Switch Circuit Breaker

,						
	OPERATING	HOURS (X 10 ⁶)	0.425	0.829	0.829	
	NUMBER FAILED		<u>~</u>	2	ю	
	60% CONFIDENCE INTERVAL	UPPER	7.057	5.172	6.655	
FAILURE RATE/10 ⁶ HOURS		LOWER	0.525	0.993	1.852	
	60% UPPER SINGLE - SIDED CONFIDENCE		!	-	!	
	<<		2.352	2.411	3.617	
	CHARACTERISTICS		3 Pole, 200-1600A	3 Pole, 200-1600A	3 Pole, 200-1600A	
	SPEC NUMBER	MANUFACTURER				
	3		GRF	GRF	GRF	

PART CLASS: CIRCUIT PROTECTION DEVICE

TYPE: Undervoltage Circuit Breaker

		,			
,	OPERATING	HOURS CK 10 ⁶)	3.504	0.774	
	NUMBER	FAILED	∞	0	
	CE INTERVAL	UPPER	3.236	t t	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	1.591	t 1	
	601 UPPER SINGLE-SIDED CONFIDENCE			1.178	
	(4		2.283	!	
		CHARACTERISTICS	Instant, 208/120 VAC	Time Delay, 208/120 VAC	
	SPEC NUMBER	PART NUMBER MANUFACTURER			
		Ž.	GRF	GRF	

PART CLASS: COMPRESSOR

TYPE: Air

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
	SPEC NUMBER			60% UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
E M	PART NUMBER MANUFACTURER	CHARACTERISTICS	<	CONFIDENCE	LOWER	UPPER	FAILED	πυακς (Χ. 10 ⁶)
GRM		Reciprocal, 150 psi, 300 CFH	1.980	;	1.441	2.696	10	5.059
GRM		Reciprocal, 150 psi, 300 CFH	5.959	i ! !	4.788	7.402	19	3.188
GRM		Reciprocal, 200 psi, 600 CFH	20.250	i	17.087	24.059	30	1.412
SHS		Reciprocal, 125 psi, 3000 CFH, 2 Stage	193.000	<u>;</u>	134.400	273.300	∞	0.041
SHS		Reciprocal, 250 psi, 900 CFH, 2 Stage	235.000	}	155.000	304.500	14	090.0
SHS		Reciprocal, 3000 psi, 30 CFH, 6 Stage	721.000	:	632.800	823.700	49	0.068
SHS		Reciprocal, 4500 psi, 13 CFH, 4 Stage	1892.000	\$ 1 2	1736.000	2056.000	107	0,057

PART CLASS: CONNECTOR

TYPE: Circular

				FAJI UK. P.	FATURE RAIF/10 ⁶ HOUPS			
28.5	SPEC NUMBER	ON THE BUT AND AND	<	3 Kath 109	60% CONFIDENCE	HOF INTERVAL	RUMBER	OPEPATING HOUSE
	MANUFACTURER	בטאאער ובאואוורא	٧	CONFIDENCE	LOWFR	nithro	FALLED	(x10 ⁶)
DOR	MIL-C-26482 UR Series Deutsch		!	0.027		!	0	34.627
SAT	MIL-C-26482	Insert D, 4P, 20G, 7.5A	;	1	;	;	0	0.019
SAT	MIL-C-26482	Insert D	;	:	;	! !	0	0.010
SAT	MIL-C-26482 UR Series Deutsch	Insert D	;	0.036	!	;	0	25.454
GRF	MIL-C-5015	Insert D	0.166	:	0.137	0.202	24	144.319
GRF	MIL-C-5015	Insert B, 42P	; ;	8 8	1	:	0	0.199
GRF	MIL-C-81511	Insert B, 85P, 23G	! !	1	1	;	0	0.398
GRF	MIL-C-81511	Insert D	7.559	!	5.835	908.6	14	1.852
GRF	MS3124E12	Insert E, 10P, 20G, Crimp	1	0.083	i !	i	0	1.026
GRF	MS3124£20	Insert E, 41P, 20G, Crimp	ļ	• • •	:	:	0	0.342
GRF	MS3102A22	Insert A, 19P, 16G, Solder	;	;	:	;	0	0.342
GRM	MIL-C-5015	Insert B, 7P, 8G, 73A	-	!	ļ	1	0	0.014
GRM	M1L-C-5015	Insert B, 14P, 16G, 22A	i	;	! !	:	0	0.014
GRM	MIL-C-26482	Insert D, 5P, 16G, 22A	1	!	;		0	0.007
GRM	MIL-C-26482	Insert D, 55P, 20G, 7.5A	:	1	:	-	0	0.007

PART CLASS: CONNECTOR

rre: Circular (continued)

NIL-C-26482 Insert A, 16P, 206, Insert B, 30P, 20C, Insert B, 30P, 20C, Insert					FAILURE R	FAILURE RATE/10 ⁶ HOURS			
MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert A, 3P, 166, 0 MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert B, 32P, 206, 0	EN	SPEC NUMBER PART NUMBER	CHARACTERISTICS	(4	60% UPPER SINGLE - SIDED		3	NUMBER	OPERATING HOURS
MIL-C-26482 Insert D, 55P, 206, 0 MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert A, 3P, 166, 0 MIL-C-26482 Insert A, 6P, 166, 0 MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert B, 32P, 206, 0 MIL-C-26482 Insert B, 32P, 206, 0 MIL-C-26482 Insert B, 32P, 206, 0 MIL-C-26482 Insert B, 30P, 226 0		MANUFACTURER			CONF I DENCE	ı	UPPER	FAILED	Q 106)
MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert A, 1P, 206, 0 MIL-C-26482 Insert A, 6P, 166, 0 MIL-C-26482 Insert A, 15P, 206, 0 MIL-C-26482 Insert A, 16P, 206, 0 MIL-C-26482 Insert A, 16P, 206, 0 MIL-C-26482 Insert A, 16P, 206, 0 MIL-C-26482 Insert A, 30P, 206, 0 MIL-C-26482 Insert A, 30P, 206, 0 MIL-C-26482 Insert B, 30P, 226 0	GRM	MIL-C-26482	<u>.</u>		!	i ;	:	0	0.014
MIL-C-26482 Insert A, 1P, 20G, 0 MIL-C-26482 Insert A, 3P, 16G, 0 MIL-C-26482 Insert A, 6P, 16G, 0 MIL-C-26482 Insert A, 15P, 20G, 0 MIL-C-26482 Insert A, 16P, 20G, 0 MIL-C-26482 Insert A, 30P, 20G, 0 MIL-C-26482 Insert B, 32P, 20G, 0	AI	M1L-C-26482		:	-	!		0	0.004
MIL-C-26482 Insert A, 3P, 166, 0 MIL-C-26482 Insert A, 6P, 16G, 0 MIL-C-26482 Insert A, 15P, 20G, 0 MIL-C-26482 Insert A, 16P, 20G, 0 MIL-C-26482 Insert A, 16P, 20G, 0 MIL-C-26482 Insert A, 30P, 20G, 0 MIL-C-26482 Insert B, 32P, 20G, 0 MIL-C-26482 Insert B, 30P, 22G 0	AI	MIL-C-26482	1P, 20G,	;	1	!	1 # 1	0	0.004
MIL-C-26482 Insert A, 6P, 16G, 0 MIL-C-26482 Insert A, 15P, 20G, 0 MIL-C-26482 Insert A, 16P, 20G, 0 MIL-C-26482 Insert A, 16P, 20G, 0 MIL-C-26482 Insert A, 30P, 20G, 0 MIL-C-26482 Insert B, 32P, 20G, 0 MIL-C-26482 Insert B, 32P, 20G, 0 MIL-C-26482 Insert B, 32P, 20G, 0 MIL-C-26482 Insert B, 30P, 22G 0 MIL-C-81511 Insert B, 30P, 22G 0 MIL-C-81511 Insert B, 30P, 22G 0	AI	MIL-C-26482	Insert A, 3P, 16G, 22A	! ! !	!	\$ \$ \$;	0	0.004
MIL-C-26482 Insert A, 15P, 20G, 0 MIL-C-26482 Insert A, 16P, 20G, 0 MIL-C-26482 Insert A, 30P, 20G, 0 MIL-C-26482 Insert B, 32P, 20G, 0 MIL-C-26482 Insert B, 32P, 20G, 0 MIL-C-81511 Insert B, 30P, 22G 0	AI	MIL-C-26482	_	;	1	: 1 1	!	0	0.004
MIL-C-26482 Insert A, 16P, 20G, 0 7.5A	AI	MIL-C-26482	15P,	!	:	:	ł	0	0.004
MIL-C-26482 Insert A, 16P, 20G, 0 7.5A MIL-C-26482 Insert B, 32P, 20G, 0 MIL-C-81511 Insert B, 30P, 22G 0	AI	MIL-C-26482	16P,	;	!		{	0	0.004
MIL-C-26482 Insert A, 30P, 20G, 0 7.5A MIL-C-26482 Insert B, 32P, 20G, 0 7.5A MIL-C-81511 Insert B, 30P, 22G 0	AI	MIL-C-26482	16P,	!	;	;	;	0	0.004
MIL-C-26482 Insert B, 32P, 20G, 0 7.5A MIL-C-81511 Insert B, 30P, 22G 0	AI	M1L-C-26482	30P,	† †	;	!	į	0	0.004
MIL-C-81511 Insert B, 30P, 22G 0	AI	M1L-C-26482	B, 32P,	į	1	1 1 1		0	0.004
	AI	MIL-C-81511	30P,	! !	1 1		1	0	0.004

PART CLASS: CONNECTOR

TYPE: Circular (continued)

				FAILURE R	FAILURE RATE/10 ⁶ HOURS		_	
	SPEC NUMBER		<	60% UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL	NIMAFE	OPERATING
A C	PART NUMBER MANUFACTURER	CHARACTER I ST I CS	~	SINGLE SIDED CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
AI	MIL-C-81511	Insert B, 68P, 20G	!	!	-		0 .	0.004
AI	MIL-C-81511	Insert B, 85P, 23G	! ! !	:	!	:	0	0.099
AI	MIL-C-81511	Insert B	!	1	1 1	!	0	0.099
AI	MIL-C-81511	Insert B, 55P, 22G	† ! !	!	1 1	i ! !	0	0.004
AI	MIL-C-81511	Insert B, 68P, 22G	! !	1		1 1	0	0.004
AU	M1L-C-5015	Insert D	0.961	-	0.890	1.038	133	138.465
Au	MIL-C-5015	Insert D	1.893	: : :	1.699	1.992	124	67.423
Au	MIL-C-26482	Insert D, 21P, 16G	0.281	i i	0.183	0.426	9	21.387
AU	MIL-C-38999	Insert D	0.017	:	0.013	0.022	15	866.817
ΑU	MIL-C-81511	Insert D	!	1	!	!	0	0.028
AUF	MIL-C-38999	5P, 16G, 13A	!	!!	!	:	0	0.096
AUF	MIL-C-38999	Insert B, 13P, 22G, 3A	;	1.231	;	-	O	0.744
AUF	MIL-C-38999	Insert B, 22P, 22G, 3A	!!!	:	;	!	0	090.0
AUF	MIL-C-38999	Insert B, 37P, 22G, 3A	• • •	‡ !	;	i i	0	0.036
AUF	MIL-C-38999	Insert B, 128P, 22G, 3A	!	:	!	i i	0	090.0

PART CLASS: CONNECTOR

j		Circular (continued)		FAILURE	FAILURE RATE/10 HOURS				
	TYPE:								- 1
ENV	SPEC NUMBER PART NUMBER HANUFACTURER	CHARACTERISTICS	⟨ «	60% UPPER 5 INGLE - SIDED CONFIDENCE	1 OMER CONTIDENCE INFER	ILERVAL	NUMBER FALLER	OPERATING HOURS (X10 ⁶)	
SHS	MIL-C-5015	Insert D	0.691	;	0.397	1.168	4	5.791	1
SHS	MIL-C-38999	Insert D	0.650	: ;	0.129	1.976		1.539	
SHS	MS3106A28	Insert D, 37P, 16G	!	0.920	:	;	0	966.0	
SHS	MS3102R22	Insert D, 19P, 18G, Solder, Environmental, Gold Plate Contacts	;	1	!	}	0	0.498	
SHS	MS3102R28	Insert D, 37P, 16G, Solder, Gold Plate Contacts	i	0.368	!	:	0	2.490	
SUB	MIL-C-5015	Insert B, 3P, 16G, 22A	}	;	1	:	0	0.009	
SUB	MIL-C-5015	Insert B, 3P, 16G, 22A	1 1	;	;	1	0	0.003	
SUB	MIL-C-5015	Insert B, 4P, 16G, 22A	' !	1 1 ,	1 1	1 1 1	0	0.009	
SUB	MIL-C-5015	Insert B, 4P, 16G, 22A	{	1	:	i 1 1	0	0.018	
SUB	MIL-C-5015	Insert B, 4P, 16G, 22A	!	t 1	1	i i 1	0	0.007	
SUB	MIL-C-5015	Insert B, 4P, 16G, 22A	-	!	t I t	1	0	0.003	
SUB	M1L-C-5015	Insert B, 5P, 12G, 41A	1	!	1	; ;	0	0.009	
SUB	MIL-C-5015	Insert B, 5P, 12G, 41A	1	!	-	1 1	0	0.003	
SUB	MIL-C-5015	Insert B, 10P, 16G, 22A	}	i	! !	!	0	0.009	
SUB	MIL-C-5015	Insert B, 10P, 16G, 22A	-	!	!	t 1	0	0.003	
SUB	MIL-C-5015	Insert B, 14P, 16G, 22A	:	!	1	!	0	0.009	
SUB	MIL-C-5015	Insert B, 14P, 165, 22A	1 1	:	f !	!	0	0.016	
SUB	MIL-C-5015	Insert B, 14P, 16G, 22A	!	1		;	0	0.003	
SUB	MIL-C-5015	Insert B, 14P, 16G, 22A	;		r 1	:	0	0.007	$\overline{}$

PART CLASS: CONNECTOR

TYPT: Circular (continued)

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
ENV	SPEC NUMBER PART NUMBER	CHARACTERISTICS	⟨≪	60% UPPER SINGLE -SIDED	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER	OPERATING HOURS
	MANUFACTURER			CONF I DENCE	LOWER	UPPER	(13)	(X 106)
SUB	MIL-C-5015	Insert B, 28P, 16G, 22A	1 1	1	!	;	0	0.016
SUB	MIL-C-5015	Insert B, 28P, 16G, 22A	!		1	;	0	0.007
SUB	MIL-C-5015	Insert B, 37P, 16G, 22A	1	1	!	1 1 1	0	0.003
SUB	M1L-C-5015	Insert B, 37P, 16G, 22A	-	!	 	1 1	0	0.018
SUB	MIL-C-5015	Insert B, 37P, 16G, 22A) (!	! !	!	0	0.016
SUB	M1L-C-5015	Insert B, 37P, 16G, 22A	!,	!	 	;	0	0.007
SUB	MIL-C-5015	Insert B, 37P, 16G, 22A	;	!	!	;	0	0.007
SUB	MIL-C-5015	Insert B, 48P, 16G, 22A	}	{	-	;	0	0.003
SUB	MIL-C-5015	Insert B, 48P, 16G, 22A	;	f 1	1	;	0	0.016
SUB	MIL-C-5015	Insert B, 48P, 16G, 22A	† ; (:	 	1	0	0.007
SUB	MIL-C-26482	Insert B, 4P, 16G, 22A; 8P, 20G, 7.5A	}	:	! !	! !	0	0.032
SUB	MIL-C-26482	Insert B, 4P, 16G, 22A; 8P, 20G, 7.5A	}	; !	i i t	!	0	0.032
SUB	MIL-C-26482	Insert B, 6P, 20G, 7.5A	!	!	;	:	0	0.013
SUB	MIL-C-26482	Insert B, 6P, 20G, 7.5A	;	;	1	;	0	0.029
							7	

PART CLASS: CONNECTOR

TYPE: Circular (continued)

				FAILURE R.	FAILURE RATE/10 ⁶ HOURS			
Fix	SPEC NUMBER	200000000000000000000000000000000000000	٠	601 UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
	MANUFACTURER	CHARACTER 131 ICS	<	CONF IDENCE	LOWER	UPPER	FAILED	α 10 ⁶)
SUB	MIL-C-26482	Insert B, 32P, 20G, 7.5A	1 1	j 1	ë i	l 1 2	0	0.023
SUB	M1L-C-26482	Insert D, 4P, 16G, 22A; 8P, 20G, 7.5A	1 1	:	† !	1 1 1	0	0.013
SUB	MIL-C-26482	Insert D, 4P, 16G, 22A; 8P, 20G, 7.5A	; t		j 1 2	:	0	0.041
SUB	MIL-C-26482	Insert D, 4P, 16G, 22A; 8P, 20G, 7.5A	t 1	<u> </u>	}	! !	0	0.032
SUB	MIL-C-26482	Insert D, 4P, 16G, 22A; 8P, 20G, 7.5A	; 1 8	 	;	;	0	0.013
SUB	MIL-C-26482	Insert D, 6P, 20G, 7.5A	;	;	;	}	0	0.032
SUB	MIL-C-26482	Insert D, 6P, 20G, 7.5A	;	;	1	!	0	0.026
SUB	MIL-C-26482	Insert D, 6P, 20G, 7.5A	;	1 1	;	}	0	0.035
SUB	MIL-C-26482	Insert D, 32P, 20G, 7.5A	;	i !	1 1	:	0	0.010
SUB	MIL-C-26482	Insert D, 32P, 20G, 7.5A	1 1 1	!	;	:	0	0.003
SUB	MIL-C-26482	Insert D, 32P, 20G, 7.5A	;	i	;	!	0	0.010

PART CLASS: CONNECTOR

rree: Circular (continued)

ļ	_									 	
	OPERATING	HOORS (× 10 ⁶)	0.025	900.0	0.009	0.009	0.012	0.054	0.052		
	NUMBER	FALLED	0	0	0	0	0	0	0		
	ICE INTERVAL	UPPER	;	•	:	;	;	{	1		
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	;	* !	;	:		!	-		
FAILURE R	601 UPPER	SINGLE-SIDED CONFIDENCE	:	-	ì	t 1 1	1 1	i	:		
	<	~	;	}	;	}	: : :	}	!!		
		CHARACTERISTICS	Insert D, 32P, 20G, 7.5A	Insert D, 61P, 20G, 7.5A	Insert D, 61P, 20G, 7.5A	Insert D, 61P, 20G, 7.5A	Insert B, 37P, 22 G, 3A	Insert B, 56P, 22G, 3A	Insert B, 100P, 22G, 3A		
	SPEC NUMBER	PART NUMBER MANUFACTURER	MIL-C-26482	MIL-C-26482	MIL-C-26482	MIL-C-26482	M1L-C-38999	M1L-C-38999	M1L-C-38999		
	, 1	E	SUB	SUB	SUB	SUB	SUB	SUB	SUB		

PART CLASS: CONNECTOR

TYPE: Coaxial

0 0 0 0				7	7	7	H	Ä	0.019 0.042 0.042 0.031 0.073 0.146 133.333 6.785 0.405 14.351 0.199
0 0 0 0	0000	00000	0 0 0 0 0 0 4	0000040	0 0 0 0 0 0 4 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0
				0.051	0.051	0.051	0.051	0.051	0.051
							0.017	0.017	0.017
1 1 1	1 1 1 1	1 1 1 1 1	1 1 1 1 1 1	 1.350	 1.350	 1.350 	 1.350 0.064	 1.350 0.064	 1.350 0.064
<u> </u>	· · · · · · · · · · · · · · · · · · ·	<u> </u>	0.030	0.030	0.030	0.030	0.030	0.030	0.030
	Insert C Insert C Insert C Insert C			Insert C Insert C Insert C Insert C Insert C Insert C	Insert C Insert C Insert C Insert C Insert C Insert C 3 Port	Insert C Insert C Insert C Insert C Insert C Insert C 3 Port 8 Port	Insert C Insert C Insert C Insert C Insert C Insert C 3 Port 8 Port Insert C	Insert C Insert C Insert C Insert C Insert C 3 Port 8 Port Insert C	Insert C Insert C Insert C Insert C Insert C 3 Port 8 Port Insert C
IIL-C-39012 IIL-C-39012	41L-C-39012 41L-C-39012 41L-C-39012 41L-C-39012	IIL-C-39012 IIL-C-39012 IIL-C-39012 IIL-C-39012	IL-C-39012 IIL-C-39012 IIL-C-39012 IIL-C-39012	IL-C-39012 IIL-C-39012 IIL-C-39012 IIL-C-39012	IIL-C-39012 IIL-C-39012 IIL-C-39012 IIL-C-39012	11-C-39012 11-C-39012 11-C-39012 11-C-39012	MIL-C-39012 MIL-C-39012 MIL-C-39012 MIL-C-39012 MIL-C-39012	MIL-C-39012 MIL-C-39012 MIL-C-39012 MIL-C-39012 MIL-C-39012	MIL-C-39012 MIL-C-39012 MIL-C-39012 MIL-C-39012 MIL-C-39012
= =	F F F						EEEE		YYY
	Insert C	Insert C Insert C	Insert C Insert C Insert C	Insert C Insert C 0.030 0.017	Insert C Insert C 2 Port 1.350 3 Port 1.350	Insert C Insert C 2 Port 1.350 3 Port 0.064	Insert C 1.350 Insert C 0.030 0.017 2 Port 1.350 3 Port 0.064 Insert C 0.064	Insert C 1.350 S Port 1.350 0.017 R Port 0.064 1.550	Insert C 1.350 S Port 1.350 0.017 R Port 0.064 1.550 Insert C 1.350

PART CLASS: CONNECTOR

TYPT: Power

	OPERATING	HOURS (X 10 ⁶)	0.032	6.740						
	NUMBER	FAILED	0	0						
	ICE INTERVAL	UPPER	:	!						
FAILURE RAIE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	1 8	;			•			
FAILURE R	60% UPPER	CONF FOENCE	į	0.136					 	
		<		;						
		CHARACTER I ST I CS	Insert D, 3P, 15A, 30 ^o C	Insert D, 10A, 0.1 Stress, 30°C						
	SPEC NUMBER	PART NUMBER MANUFACTURER	MIL-C-3767	MIL-C-3767						
	3	À.	GRF	GRF				 		

PART CLASS: CONNECTOR

TYPE: Printed Circuit Board

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
242	SPEC NUMBER		<	60% UPPER	60% CONFIDENCE INTERVAL	HE INTERVAL	NUMBER	OPERATING
P L	PAKT NUMBER MANUFACTURER	CHARACTERISTICS	<	SINGLE - SIDED CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
DOR	MIL-C-55302 /23, /24 AMP 202	75 ⁰ - 125 ⁰ c		0.0648	;	;	0	14.140
SAT	MIL-C-55302 /23, /24 AMP 202			0.0881	!	;	0	10.397
GRF	MIL-C-21097	Insert B, 44P, 5A	<u> </u>	1	1	;	0	0.022
GRF	MIL-C-21097	Insert B, 44P, 5A	} ! !			;	0	0.023
GRF	MIL-C-21097	Insert B, 44P, 5A	,	1	: :	;	0	0.028
GRF	MIL-C-21097	Insert B, 44P, 5A	!	:	1	;	0	0.013
GRF	MIL-C-21097	Insert B, 50P, 5A	;	1		ŧ ;	0	0.026
GRF	MIL-C-21097	Insert B, 72P	; ;	1	1 1	;	0	0.009
GRF	MIL-C-21097	Insert B, 72P	1	:	!	<u>;</u>	0	0.013
GRF	MIL-C-21097	Insert B, 72P	-			i !	0	0.066
GRF	MIL-C-21097	Insert B	1	0.630	1 3) ! 	0	1.454
GRF	MIL-C-21097	Insert B, 72P, 5A	;	;		! !	0	0.016
GRM	MIL-C-21097	Insert B, 80P, 5A, 30°C	!	0.058	!	;	0	15.714
GRM	MIL-C-21097	Insert B, 80P, 5A, 30 ^o C		0.044	1 1	(} 1	0	21.031

PART CLASS: CONNECTOR

*** Printed Circuit Board (continued)

:				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
	SPEC NUMBER		<	601 UPPER	60% CONFIDEN	60% CONFIDENCE INTERVAL	NUMBER	OPERATING
EN	PART NUMBER MANUFACTURER	CHARACTERISTICS	Z	SINGLE -SIDED CONFIDENCE	LOWER	UPPER	'AILED	HOURS (X 10 ⁶)
AI	MIL-C-55302	Insert B, 96P, 55°C			1	1 2 1	0	0.090
ΑΙ	MIL-C-55302	Insert B, 112P, 45°C	0.173	! !	0.034	0.527		5.770
AIF	MIL-C-55302	Insert B, 16P, 40 ^O C	ł 1	0.495	: :	;	0	1.850
AIF	MIL-C-55302	Insert B, 32P, 40°C	; †	0.603	1	1 1	0	1.520
AIF	MIL-C-55302	Insert B, 41P, 40°C	;	0.565	!	;	0	1.620
AIF	MIL-C-55302	Insert B, 62P, 40°C	;	0.077	!	;	0	11.930
AIF	MIL-C-55302	Insert B, 62P, 40°C	1	0.090	1 1	:	0	10.200
AIF	MIL-C-55302	Insert B, 64P, 40°C	!	1.735		1 1	0	0.528
AIF	MIL-C-55302	Insert B, 71P, 40°C	l l	0.475	1 2 1	1	0	1.930
AIF	MIL-C-55302	Insert B, 72P, 40°C	i ! i	0.490		!	0	1.870
AIF	MIL-C-55302	Insert B, 77P, 40°C	!!!	°.391	2	!	0	2.340
SHS	MIL-C-21097	Insert B, 30°C	0.011	! !	0.002	0.034		88.339
SUB	MIL-C-55302	Insert 3, 110P, 26G, 3A, 25 ^o C	;	:	:	: :	0	0.018
SUB	MIL-C-55302	Insert 3, 110P, 26G, 3A	1 1	:	1 1	! !	0	0.036
SUB	MIL-C-55302	Insert B, 110P, 26G, 3A	•	-	: :	:	0	0.008
SUB	MIL-C-55302	Insert B, 110P, 26G, 3A	1 1		i J	1 .	0	0.014

PART CLASS: CONNECTOR

TYPE: Rectangular

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
	SPEC NUMBER		•	601 UPPER	60% CONFIDENCE	HCE INTERVAL	NUMBER	OPERATING
ENV	PART NUMBER MANUFACTURER	CHARACTERISTICS	«	SINGLE - SIDED CONFIDENCE	1.OWER	UPPER	FAILED	MOURS (X 10 ⁶)
SAT	MIL-C-24308	Insert B, 25 ^o C		1.105		:	0	0.829
GRF	MIL-C-24308	Insert B, 14P, 45 ^O C	! !	1		!	0	0.298
GRF	MIL-C-24308	Insert B, 14P, 45 ^O C, 0.2 Stress	!	!	1	;	0	0.198
GRF	MIL-C-24308	Insert B, 42P, 45 ^o C	! !	! !		1	0	0.199
GRF	MIL-C-24308	Insert B, 42P, 45 ^O C 0.2 Stress	:	;	;	į	0	0.198
GRF	MIL-C-24748	Insert B, 104P, 20G, 7.5A, 30ºC	, }	!	1 1	:	0	0.041
GRM	MIL-C-24308	Insert B, 9P, 20G, 30 ^o C	i i 1	;	f 	!	0	0.014
GRM	MIL-C-24308	Insert B, 15P, 20G, 5A, 30°C	:	:	:	;	0	0.028
GRM	MIL-C-24308	Insert B, 15P, 20G, 5A, 30 ^o C	;	:	:	1	6	0.021
GRM	MIL-C-24308	Insert B, 25P, 20G, 5A, 30 ^o c	;	:	:	1	0	0.014
AI	MIL-C-24308	Insert A, 16P, 22G, 3A, 55°C	:		# 6 1	;	0	0.008
AI	MIL-C-24308	Insert A, 16P, 22G, 5A, 55°C	t t	i 1	-	1	0	0.064

PART CLASS: CONNECTOR

rvre: Rectangular (continued)

			FAILURE R.	FAILURE RATE/16 ⁶ HOURS			
SPEC NUMBER	171131831J484NJ	<-	60\$ UPPER	60% CONFIDENCE INTERVAL	HE INTERVAL	NUMBER	OPERATING
	CHARACIERISTICS	<	CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
	Insert A, 17P, 20G, 5A, 55°C	:	 	:		0	0.008
	Insert A, 25P, 20G, 5A, 55 ^o C	1	! !	1 1	1	0	0.004
	Insert A, 25P, 20G, 5A, 55°C		;	!	!	0	0.004
	Insert A, 37P, 22G, 5A, 55°C	!	!	;	!	0	0.004
	Insert B, 6P, 45 ^O C	ļ	1	<u> </u>	}	0	0.050
	Insert B, 14P, 45°C		-	1	;	0	0.075
	Insert B, 14P, 45 ^o C	!	-	:	;	ပ	0.050
	Insert B, 15P, 20G, 5A, 55 ^o C	!	!		•	0	0.004
	Insert B, 20P, 45 ⁰	!	!	1	:	0	0.149
	Insert B, 28P, 45 ^o C	;		1	;	0	0.597
	Insert B, 42P, 45 ^o C	-	! !	-	:	0	0.050
	Insert B, 42P, 45 ⁰ C, 0.2 Stress	! !				0	0.050

PART CLASS: CONNECTOR

TYPE: Rectangular (continued)

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
200	SPEC NUMBER		¢	601 UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	MUMBER	OPERATING
	MANUFACTURER	CHARACTERISTICS	<	SINGLE - SIDED	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
ΑΙ	MIL-C-24308	Insert B, 55P, 45 ^o c					0	0.024
AI	MIL-C-24308	Insert B, 55P, 45 ^O C	ļ	j { 	;	;	0	0.075
AI	MIL-C-24308	Insert B, 66P, 45°C	1 1 1	}	(} }	1	0	0.050
AI	MIL-C-24308	Insert B, 168P, 45°C	à 2 ?	;	f i	-	0	0.447
AIF	MIL-C-83733	Insert B, 131P, 22G, 5A, 40°C	!	:	;	:	0	0.144
AIF	M1L-C-83733	Insert B, 185P, 22G, 5A, 40°C	-}	:	:	;	0	0.048
AIF	MIL-C-83733	Insert B, 185P, 22G, 5A, 40°C	;	0.877		1	0	1.044
SUB	M1L-C-24308	Insert B. 9P, 20G, 5A, 25°C	;	!	•	! ; t	0	0.032
SUB	MIL-C-24308	Insert B, 9P, 20G, 5A, 35°C	! ! !		}	! !	0	0.013
SUB	MIL-C-24308	Insert B, 25P, 20G, 5A, 25 ^o C	:	:	\$ \$ \$	}	0	0.014
SUB	MIL-C-24308	Insert B, 25P, 20G, 5A, 250C	•	1	1 1	;	0	0.08£

PART CLASS: CONNECTOR

TYPE: Rectangular (continued)

				FAILURE RA	FAILURE RATE/106 HOURS			
	SPEC NUMBER		<	601 UPPER	60% CONFIDENCE INTERVAL	ICE INTERVAL	NUMBER	OPERATING
ENY	PART NUMBER MANUFACTURER	CHARACTERISTICS	<	CONFIDENCE	LOWER	UPPER	railed	HOURS (X 10 ⁶)
SUB	MIL-C-24308	Insert B, 25P, 20G, 5A, 25°C				! !	0	0.014
SUB	MIL-C-24308	Insert B, 25P, 20G, 5A, 25°C	; !	÷	!!!	; ;	0	0.007
SUB	MIL-C-24308	Insert B, 25P, 20G, 5A, 350C	;	t f	!	!	0	0.032
SUB	MIL-C-24308	Insert B, 37P, 20G, 5A, 35 ^o C) 	! !	!	!	0	0.010
SUB	MIL-C-24308	Insert B, 37P, 20G, 5A, 250C	;	į	!	1	0	0.026
SUB	MIL-C-24308	Insert B, 50P, 20G, 5A, 350 _C		!	1 1 1		0	0.003
SUB	MIL-C-24308	Insert B, 50P, 20G, 5A, 35°C	:		:	!	0	900.0
SUB	MIL-C-24308	Insert B, 50P, 5 A, 250C	! !	1	1	!	0	0.016
SUB	MIL-C-24308	Insert 8, 50P, 20G, 5A, 250C	!	}	i I	i i	0	0.009
SUB	MIL-C-24308	Insert B, 78P, 22G, 3A, 25°C	})) !	}	!	0	0.009

PART CLASS: CONNECTOR

TYPE: Rectangular (continued)

,					
	OPERATING HOURS	CK 10 ⁶)	0.003	0.016	
	NUMBER	FAILED	0	0	
	ICE INTERVAL	UPPER	1	}	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	1		
FAILURE R.	601 UPPER	CONFIDENCE		;	
	<-		# 	-	
	CHABACTERICATOR	CIMMACIEN 131 1C3	Insert B, 78P, 22G, 3A, 35oc	Insert B, 104P, 22G, 3A, 25°C	
	UMBER	CTURER	4308	24308	
	SPEC NUMBER	MANUFA	MIL-C-24308	MIL-C-24308	

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: COMPASS

OPERATING HOURS (X 10⁶) 0.180 0.435 0.458 0.301 NUMBER FAILED 719 267 18 30.874 51.890 2466.813 615.069 60% CONFIDENCE INTERVAL
LOWER UPPER FAILURE RATE/10 HOURS 33.059 8.507 2313.486 552.792 SINGLE - SIDED -41.379 16.667 582.969 2388.704 << CHARACTERISTICS Bearing Heading Indicator Magnetic Magnetic Magnetic SPEC NUMBER PART NUMBER MANUFACTURER AIT AIT AIT EN AI

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: Indicator

				FAILURE #	FAILURE RATE/10 ⁶ HOURS			
ENV	SPEC NUMBER	CHARACTERISTICS	(*	601 UPPER	601 CONFIDE	60% CONFIDENCE INTERVAL	MUMBER	OPERATING
	MANUFACTURER		Š	CONF I DENCE	LOWER	UPPER	FAILED	(X 10 ⁶)
GRF		Liquid Level	11.905	:	4.843	25.733	2	0.168
GRF		Liquid Quantity - Storage Tank, Float Type	6.718		4.541	9.827	7	1.042
GRF		Meter	0.363	-	0.208	0.608	4	11.028
GRM		Temp Gauge	62.016	-	54.406	70.807	48	0.774
GRM		Fuel Quantity	78.811		70.240	88.556	61	0.774
AI		Fuel Quantity	35.124	!	27.855	44.367	17	0.484
ΑΙ		Vertical Speed	942.197	!	879.700	1009.821	163	0.173
AI		Slip Turn	1346.939	;	1247.601	1455.368	132	0.098
AI		Slip Turn	1 1	i	1	1	0	0.090
AIT		Fuel Quantity	170.492	1	164.176	177.094	520	3.050
AIT		Fuel Quantity	145.902	!	132.782	160.495	89	0.610
AIT		Fuel Quantity	191.892	1	178,250	206.736	142	0,740
AIT		Тетр	24.490	1.	20.229	29.709	24	0.980
AIT		Temp	242.574	ŀ	229.463	256.558	245	1.010
AIT		Тетр	299.99	-	61.420	72.427	116	1.740

PART CLASS: CONTROLS AND INSTRUMENTS

rre: Indicator (continued)

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
A. 10	SPEC NUMBER		4	601 UPPER	60% CONFIDENCE	HCE INTERVAL	NUMBER	OFERATING
	MANUFACTURER	CHARACIERISTICS	<	CONFIDENCE	LOWER	UPPER	FAILED	MOURS (X 106)
AIT		Vertical Speed	275.000	1	250.130	302.679	88	0.320
AIT		AIM Control System	69.451	:	64.531	74.803	143	2.059
HEL		Vertical Speed	41.958	! !	27.333	63.736	9	0.143
HEL		Vertical Speed	27.273	t I	13.920	50.521	8	0.110
HEL		Temp	133.816	1	120.611	148.653	74	0.553
HEL		Тетр	126.829	!	111.882	144.002	52	0.410
HEL		Fuel Quantity	305.419	-	272.474	342.834	62	0.203
HEL		Fuel Quantity	10.938	1	7.406	16.048	7	0.640
HEL		Fuel Quantity	4666.667	1	3915.458	5573.458	28	0.006
HEL		Fuel Quantity	150.000	: :	136.113	165.494	84	0.560
HEL		Fuel Quantity	285.714	1	164.074	482.985	4	0.014
HEL		Engine Torque	75.000	1	56.510	99.581	12	0.160
HEL		Engine Torque	84.416	:	64.424	110.705	13	0.154
HEL		Engine Torque	275.862	!	255.200	298.446	128	0.464
ÆL		Engine Torque	666.667	:	576.998	771.680	40	090.0
HEL		Engine Torque	357.143	! } {	220.894	567.550	5	0.014

PART CLASS: CONTROLS AND INSTRUMENTS

TYPE: Indicator (continued)

1								
	OPERATING HOURS (X 10 ⁶)	0.533	0.250	0.014	0.014	0.375	0.050	
·	NUMBER FATLED	100	48	10	2	136	6	
	CE INTERVAL UPPER	205.209	219.219	977.653	308.793	391,389	251.113	
FAILURE RATE/10 ⁶ HOURS	6nt CONFIDENCE INTERVAL LOWER UPPER	171.707	168.441	521.333	58.112	336.318	128.742	
TAILURE R	601 UPPER SINGLE-SIDED CONFIDENCE			1	7	; ;	-	
	⟨ ∢	187.617	192.001	714.286	142.857	362.667	180,.000	
	CHARACTERISTICS	Slip Turn	Slip Turn	Slip Turn	Altitude	Altitude	Altitude	
	SPEC NUMBER PART NUMBER MANUFACTURER				-			
	ENV	HEL	ÆL	퓦	HEL	HEL	HEL	

PART CLASS: EMERGENCY LIGHT

_
_
8
-
D
⊆
tar
ٽڼ
က်
w
۰
>
-

	OPERATING HOURS	(× 10b)	5.339	5.339
	NUMBER		7	14
	CE INTERVAL	UPPER	1.918	4.533
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.886	2.022
FAILURE R	60% UPPER SINGLE-SIDED	CONF IDENCE	;	;
	<<		1.311	2.622
	CHARACTERISTICS		Charger, Battery	Lighting Unit, 50 watt Battery, Automatic Recharging
	SPEC NUMBER PART NUMBER	MANUFACTURER		
	ENV	1	GRF	GRF

PART CLASS: EMERGENCY POWER

TYPE: General

,				
	OPERATING	(X 10 ⁶)	405.050	5. 7. 7. 7.
	NUMBER	FAILED	2	xo
	CE INTERVAL	UPPER	0.011	2.124
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.002	. 044
FAILURE R	60% UPPER	CONFIDENCE	:	
	4		0.0049	1.4980
		UNAKAL IERISIIUS	Stand-By Power System	6V - Emergency Light -
	SPEC NUMBER	MANUFACTURER		
	ARI	5	GRF	X X T

PART CLASS: FAN

TYPE: General

	0.829	0.829	0.829 1.894 3.318	0.829 1.894 3.318 0.829	0.829 1.894 3.318 0.829	0.829 1.894 3.318 0.829 0.798	0.829 3.318 0.829 0.798	0.829 3.318 0.829 0.798	0.829 3.318 0.829 0.798	0.829 1.894 3.318 0.829 0.798	0.829 3.318 0.829 0.912	0.829 0.829 0.798 0.912
_	2	2 21	3 2 8	33	12 2 0 0	12 2 0 0 0	12 2 0 0 0	2 2 8	0 0 3	0 0 0 3 12 5	2 21 5 0 0	2 2 8 0 0
Cr _	5.172	5.172 8.373	5.172 8.373 1.664	5.172 8.373 1.664	5.172 8.373 1.664	5.172 8.373 1.664	5.172 8.373 1.664	5.172 8.373 1.664	5.172 8.373 1.664	5.172 8.373 1.664	5.172 8.373 1.664	8.373
000	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993	0.993
	i i			1.104	1.104	1.104	1.104	1.104	1.104	1.104	1.104	1.104
	2.411	. 2.411	6.340	6.340	6.340	6.340	6.340	6.340	6.340	6.340	6.340	6.340
	Exhaust, 130 CFM, 1/25 HP	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP Box, 117 CFM	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP Box, 117 CFM	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP Box, 117 CFM	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP Box, 117 CFM Axial	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP Box, 117 CFM Axial	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP Box, 117 CFM Axial	Exhaust, 130 CFM, 1/25 HP Exhaust, 9800 CFM, 1 HP, Belt Driven Exhaust, 980 CFM, 1/6 HP Centrifugal, 4330 CFM, 2 HP Box, 117 CFM Axial
•												
	-	٦. 		RF RF	R RF RF	RF RF FF	GRF GRF GRF	38 B B B B B B B B B B B B B B B B B B B	18 18 18 18 18 18 18 18 18 18 18 18 18 1	R R R F F	R R R R R F F F F F F F F F F F F F F F	# # # # # # # # # #

PART CLASS: GENERATOR

TYPE: General

EW SPEC MANAGERE PARTING A SIGH CLASTRED STREET					FAILURE R	FAILURE RATE/10 ⁶ HOURS			
Motor Generators, 56.080	ENV	SPEC NUMBER PART NUMBER HANUFACTURER	CHARACTERISTICS	(<	60% UPPER SINGLE-SIDED CONFIDENCE	60% CONFIDE	NCE INTERVAL UPPER	NUMBER	OPERATING HOURS (X 10 ⁶)
Gas Turbine 38.050 19.482 70.015 3 Diesel Enqine, 1.209 0.873 1.890 7 150-440 KW 1.209 0.873 1.890 7 500-1400 KW 12.802 9.640 16.921 12 40-140 KW 7.470 5.542 10.022 11 Diesel Engine, 7.470 5.542 10.022 11 Gas Engine, 6.820 2.808 14.619 2 3-15 KW 2.808 14.619 2 30-60 KW 597.900 656.300 338 Motor Generator Set, 20.350 Motor Generator Set, 20.350 Motor, Generator Set, 20.350 3000 KW 3000 KW <	DOR		Motor Generators, 10 KVA	26.080	: -	47.014	162.791	28	0.499
Diesel Enqine, 1.209 0.873 1.890 7 150-440 KW 12.802 9.640 16.921 12 500-1400 KW 7.470 5.542 10.022 11 Diesel Engine, 7.470 5.542 10.022 11 Diesel Engine, 1385.000 1377.000 1399.000 4384 Gas Engine, 6.820 2.808 14.619 2 3-15 KW 0 Gas Engine, 2.808 14.619 2 30-60 KW 597.900 656.300 338 Motor Generator Set, 20.350 Motor Generator Set, 20.350 Motor Generator Set, 20.350 400HZ, 3800 RPM	DOR		Gas Turbine	38.050	:	19.482	70.015	٣	0.079
Diesel Engine, 12.802 9.640 16.921 12 500-1400 KW 7.470 5.542 10.022 11 40-140 KW 1385.000 1377.000 1399.000 4384 3000 KW 6.820 2.808 14.619 2 3-15 KW 2.808 14.619 2 30-60 KM 597.900 656.300 338 HDI-650-60 Gas Turbine, 626.200 597.900 656.300 338 Motor Generator Set, 20.350 3000W; input - 250V, 400HZ, 3000W; input - 416V, 400HZ, 3800 RPM	DOR		Diesel Enqine, 150-440 KW	1.209	! ; !	0.873	1.890		5.419
Diesel Engine, 7.470 5.542 10.022 11 Diesel Engine, 1385.000 1377.000 1399.000 4384 Gas Engine, 6.820 2.808 14.619 2 Gas Engine, 0 Gas Turbine, 626.200 597.900 656.300 338 Motor Generator Set, 20.350	DOR		Diesel Engine, 500-1400 KW	12.802	;	9.640	16.921	12	0.937
Gas Engine, 3000 KW 1385.000 1377.000 1399.000 4384 Gas Engine, 3-15 KW 6.820 2.808 14.619 2 Gas Engine, 30-60 KW 2.808 14.619 2 HDI-650-60 Gas Turbine, G26.200 626.200 597.900 656.300 338 Motor Generator Set, Uutput - 250V, 400HZ, 3800 RPM 20.350	DOR		Diesel Engine, 40-140 KW	7,470	į	5.542	10.022	11	1.437
Gas Engine, 6.820 2.808 14.619 2 3-15 KW 0 30-60 KW 626.200 597.900 656.300 338 Motor Generator Set, Output - 250V, 400HZ, 3000W; Input - 416V, 400HZ, 3800 RPM 20.350	DOR		Diesel Engine, 3000 KW	1385.000	!	1377.000	1399.000	4384	3.165
Gas Engine, 30-60 KW HDI-650-60 Gas Turbine, 300 KW Motor Generator Set, 0utput - 250V, 400HZ, 3000W; Input - 416V, 400HZ, 3800 RPM	DOR		Gas Engine, 3-15 KW	6.820	:	2.808	14.619	~	0.293
HDI-650-60 Gas Turbine, 626.200 597.900 656.300 338 Motor Generator Set, 20.350	DOR		Gas Engine, 30-60 KW	:	:	;	}	0	0.447
Motor Generator Set, 20.350 3000k; Input - 416V, 400HZ, 3800 RPM	GRF	ноі-650-60	Gas Turbine, 300 KW	626.200	1 1	597.900	656.300	338	0.540
	GRM		Motor Generator Set, Gutput - 250V, 400HZ, 3000W;Input - 416V, 400HZ, 3800 RPM	20.350	ļ			;	}

PART CLASS: GENERATOR

TYPE: General (continued)

	OPERATING	(X 10 ⁶)	
	NUMBER	FAILED	-
	CE INTERVAL	UPPER	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	
FAILURE R	601 UPPER	CONFIDENCE	 -
	«		. 66.600
		CHARACTERISTICS	Air Cooled Air Cooled
	SPEC NUMBER	MANUFACTURER	
	27.5		AUT

PART CLASS: GYRO

TYPE: Rate Integrating

	OPERATING	HOURS (X 10 ⁶)	0.270
	9	FAILED	-
	CE INTERVAL	UPPER	11.262
FAILURE BATE/106 MAIDE	60% CONFIDENCE INTERVAL		0.734
4 301111VA	601 UPPER	SINGLE-SIDED CONFIDENCE	;
		⟨ ⋖	3.704
		CHARACTERISTICS	Gas Bearing
	SPEC NUMBER	PART NUMBER MANUFACTURER	
		EM EM	A

PART CLASS: HEATER

TYPE: Electric

		-,				
	OPERATING	(X 10 ⁶)	3.318	2.488	2.116	
	NUMBER	FAILED	т	2	2	
	CE INTERVAL	UPPER	1.664	1.724	3.744	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.463	0.331	1.461	
FAILURE RA	60% UPPER	CONFIDENCE	!	1	!	
	4	<	0.904	0.804	2.363	
		CHARACTERISTICS	Coil Heating, Hot water, 120,000 BTU/HR	Space, 1KW, 208 VAC	Space, 30 KW, 480 VAC, 2 Stage	
	SPEC NUMBER	MANUFACTURER				
	29.5		GRF	GRF	GRF	

PART CLASS: MECHANICAL DEVICE

TYPE: Gear Assembly

,							 	 	
	OPERATING	MOURS (X 10 ⁶)	0.135	0.041	1.046	1.046			
	NUMBER	FAILED	∞	2	0	0			
	ICE INTERVAL	UPPER	83.950	105.926	!	1			
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	41.279	20.346	!	i !			
FAILURE R	601 UPPER	SINGLE-SIDED CONFIDENCE	(1	0.876	0.876			
	<	K	59.224	49.380	;	}			
		CHARACTERISTICS	Speed Decreaser Recorder	Speed Decreaser Servo	Spur-Drive 130 Teeth Brass Alloy 260, PD-2.0312, PA-20 ⁰	Spur-Drive 130 Teeth, Brass Alloy 260, PD-64, PA-20			
	SPEC NUMBER	PART NUMBER MANUFACTURER							
		E C	SHS	SHS	GRF	GRF			

PART CLASS: MECHANICAL DEVICE

rvre: Power Transmittal

				FAILURE R	FAILURE RATE/106 HOURS		_	
	SPEC NUMBER		<	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
ENV	PART NUMBER MANUFACTURER	CHARACTERISTICS	V	SINGLE -SIDED	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
GRF		Fan Belt	1.378		0.962	1.966	8	5.806
GRF		Fan Belt	86.957	! !	68.404	110.719	16	0.184
GRF		Couplings	5.340	;	3.067	9.028	4	0.749
GRF		Couplings	;	!	;) 6 1	0	0.109
GRF		Clutch Spring	0.594		0.571	0.619	478	804.347
GRF		5 HP Motor Coupling	5.341	1	3.066	8.945	4	0.749
GRM		Sprocket	}	;	! ! f	!	0	0.373
GRM		Magnetic Clutch	11.508	-	10.886	12.083	238	20.682
GRM		Magnetic Clutch	3.289	1	1.888	5.510	4	1.216
AU		Couplings	120.062	-	117.762	122.509	1796	14.959
SHS		Magnetic Clutch	f 1 3	1.708	i i	!	0	0.536

1								
,								

PART CLASS: MOTOR

TYPE: Full Horse Power

SPEC NUMBER PART MUNEER MANUFACTURER GRF GRF GRF GRF GRF GRF GRF GRF							
		¢	60' UPPER	60% CONFIDE	60% CONFIDENCE INTERVAL	NUMBER	OPERATING
GRF GRF GRF GRF GRF	CHARACIERISTICS	۷ .	CONFIDENCE	LOWER	UPPER	FAILED	(x_{10}^6)
GRF GRF GRF GRF GRF	3 HP	0.499		0.111	1.497	1	2.004
GRF GRF GRF GRF	2 HP (AC)	5.917	:	2.407	12.790	2	0.338
GRF GRF GRF GRF	2 HP (AC)	2.413	;	0.981	5.215	2	0.829
GRF GRF GRF	2 HP (AC)	11.765	!	4.786	25.430	2	0.170
GRF GRF	2 HP, 110 VAC, NEMA Size 1	:	0.036	!	; ; 1	0	25.455
GRF	3 HP (AC)	5.831	:	2.372	12.604	2	0.343
GRF	3 HP (AC)	1.206	!	0.239	3.668	,,	0.829
,	5 HP (AC)	4.825	1	2.771	8.157	4	0.829
GRF -	5 HP, 440 VAC, NEMA Size 1	0.943	: :	0.210	2.829	r-1	1.061
GRF	7.5 HP (AC)	10.101	(! !	2.001	30.715	-	0.099
GRF	10 HP (AC)	1.206	!!!	0.239	3.668		0.829
GRF	10 HP (AC)	205.882	} }	139.415	302.076	7	0.034
GRF	20 HP (AC)	1.206	:	0.239	3.668	~	0.829
GRF	5 to 20 HP, 230/460 VAC	5.943	:	4.582	7.705	14	2.355

PART CLASS: MOTOR

TYPE: Full Horse Power (continued)

1		- 1			
	OPERATING	πυχες (X 10 ⁶ .)	3.612	0.001	
	NUMBER	railed	13	2	
	60% CONFIDENCE INTERVAL	UPPER	4.728	4323.103	
FAILURE RATE/10 ⁶ HOURS		LOWER	2.742	813.569	
FAILURE R	60% UPPER	CONFIDENCE	!	ļ	
		٧	3,599	2000.000	
		CHARACTERISTICS	1 to 3 HP, 230/460 VDC	2 HP (AC)	
	SPEC NUMBER	PART NUMBER MANUFACTURER			
		C N C	GRM	SHS	

PART CLASS: MOTOR

TYPE: Solenoid

								 	 	
	OPERATING	(X 10 ⁶)	0.385	26.975						
	NUMBER	FAILED	0	0						
	ICE INTERVAL	UPPER	{	;						
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	:	!						
FAILURE R	60% UPPER	CONFIDENCE	;	0.034						
	(<	}	!						
		GMAKACTERISTICS	Rotary	Rotary						
	SPEC NUMBER	MANUFACTURER	008-939-1 IMC	008-939-1 IMC						
	787		90g	SAT	· -	· <u>. </u>				

PART CLASS: PUMP

TYPE: Centrifugal

		—					
	OPERATING MOLIDS	C 106)	0.526	0.377	0.749	0.829	
	NUMBER	FAILFD	10	4	7	7	
	CE INTERVAL	UPPER	25.939	17.763	13,672	12.346	
FAILURE FAIR/10 HOURS	60% CONFIDENCE INTERVAL	LOWER	13.863	6.087	6.318	5.705	
TAILURE E	60% UPPER SINGLE - SIDED CONFIDENCE		:	-	!	1	
	(-	ļ	19.02	10.605	9.346	8.439	
		UMAKACIEKISTIUS	8 GPM, 90 Ft.Hd, 1 HP, 1 in.	20 GPM, 50 Ft Hd, 3 HP, 2 in.	30 GPM, 25 Ft Hd, 1 HP, Sump	170 GPM, 173 Ft Hd, 15 HP	
	SPEC NUMBER	MANUFACTURER					
	22	,	GRF	GRF	GRF	GRF	

REGULATOR

TIPE Pressure

ĺ				-				 	
	OFERATING	HOURS (X 10 ⁶)	0.829	0.829	3,998	1.042	2.127	0,829	1.659
	NUMBER	FAILED	4	2	6.	r.	2	_	9
	CE INTERVAL	UPPER	8.078	5.172	3.127	7.601	2.017	3.617	5.486
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	2.768	0.993	1.607	2.965	0.387	0.269	2.355
FAILURE R	601 UPPER	SINGLE - SIDED CONFIDENCE	<u> </u>	!	:	!	!	!	;
	¢.	۷	4.823	2.411	2.251	4.799	0.941	1.206	3.617
		CHARACTERISTICS	Temp, Valve, 1/2 in., 150 lb., 3-way, Pneumatic Diaphragm Operated	Temp, Valve, 5/8 in., Refrigeration Expansion	Temp, Valve, 3/4 in., 150 lb, 3-way, Pneumatic, Diaphragm Operated	Valve, 1 in., 150 lb., Self Contained, 5 GPM			
	SPEC NUMBER	MANUFACTURER							
	774		GRF	GRF	GRF	GRF	GRF	GRF	GRF

PART CLASS: REGULATOR

TYPE: Pressure (continued)

ı							=			
	OPERATING	(x 10 ⁶)	2.701	1.042	3.122	2.488				
	NUMBER	FAILFD	6	т	4	e e				
	CE INTERVAL	UPPER	4.628	5.298	2.146	2.218				
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	2.379	1.474	0.735	0.617				
FAILURE RA	60% UPPER	CONFIDENCE	ŀ	i i	;	;				
	«	۲	3.332	2.879	1.280	1.206				
		CHAKACTERISTICS	Valve, 1 in., 150 lb., Self Contained, 56 GPM	Valve, 2 in., 125 lb., Gas Service, 650 CFH Expansion	Pneumatic, Differential 0.6-12 IWG	Pneumatic, Differential 0.15-3 IWG				
	SPEC NUMBER	MANUFACTURER							-	
	200	À .	GRF	GRF	GRF	GRF				

PART CLASS: REGULATOR

TYPE: Thermostatic

	OPERATING	(X 10 ⁶)	1.659	0.829	
	NUMBER	FALLED	15	ις.	
	CE INTERVAL	UPPER	11.574	13.503	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	7.043	4.709	
FAILURE R	60% UPPER	CONFIDENCE	:	:	
	⟨∙		9.042	7.234	
		CHARACTERISTICS	Temp, Pneumatig, Remgte Bulb, O to 100 ^F	Temp, Pneumatic, Bi-Metal, Room	
	SPEC NUMBER	MANUFACTURER			
	Zing.		GRF	GR F	

PART CLASS: RELAY

TYPE: Armature

					 				·	 	
	OPERATING	(X 106)	0.342	1.369	1.026	98.000	294.000	0.498	1.017		
	NUMBER	FAILED	-	4	0	S	16	2	2		
	CE INTERVAL	UPPER	4.386	4.894	;	0.081	0.069	8.614	3.875		
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.652	1.677	}	0.032	0.048	1.655	0.744		
FAILURE R	60% UPPER	CONFIDENCE	1 1	!	0.893	;	!	1	!		
	4	٧ .	2.924	2.922		0.051	0.054	4.016	1.967		
		CHAKACIERISTICS	Hermetic, 2PDT	Hermetic, 3PST, 3X Contact Form, High Voltage	Hermetic, 3PST, 3X Contact Form, High Voltage	Hermetic, 2PDT	Hermetic, 4PDT	Hermetic, 4PDT, 4C Contact Form, Low level	Hermetic, 4PDT, 4C Contact Form, Low level		
	SPEC NUMBER	MANUFACTURER	MIL-R-5757 M5757/9	MS24376	MS24143	MIL-R-39016 M39016/13	MIL-R-39016	MIL-R-5757 M5757/15	MIL-R-5757 M5757/18		
	200		GRF	GRF	GRF	AIT	AIT	SHS	SHS		

PART CLASS: RELAY

TYPE: Crystal Can

1								
	OPERATING HOURS (X 10 ⁶)	5.000	4.000	59.480	3.000	1.050	0.996	
	NUMBER FAILED	-	2	æ	56	4	0	
	CE INTERVAL Upper	0.608	1.081	0.093	10.440	6.381	;	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL LOWER UPPER	0.045	0.203	0.026	7.198	2.187	:	
FAILURE R	60% UPPER SINGLE-SIDED CONFIDENCE	;	;	;	!	:	0.920	
	<<	0.200	0.500	0.050	8.667	3,810	;	
	CHARACTERISTICS	Non-Latching, DPDT, 10A	Non-Latching, DPDT, 2A	Non-Latching, DPDT	Half size	Half size	Low level, 2PDT, 1A, Max. Coil Voltage 26.5 VDC	
	SPEC NUMBER PART NUMBER MANUFACTURER				MIL-R-5757 M5757/9	M1L-R-39016 M39016/6		
	ENA	GRF	GRF	GRF	AIT	AIT	SHS	

PART CLASS: RELAY

TYPE: General Purpose

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
FNV	SPEC NUMBER	20110 GALDAGANO	¢.	60% UPPER	60% CONFIDENCE INTERVAL	ACE INTERVAL	NUMBER	OPERATING
	MANUFACTURER	UNARACIERISTICS	<	CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
DOR	MIL-R-39016 432-850 Teledyne	DPDT	;	:	}	;	0	0.193
SAT	MIL-R-39016	DPDT, 125 ^O C	!	:	!	;	0	0.182
SAT	MIL-R-39016 432-850 Teledyne	DPDT		1		-	0	0.182
GRF	MIL-R-5757		;	!	:	;	0	0.031
GRF	M1L-R-6016	SPST, 50A	;	!	!	}	0	0.041
GRF	MIL-R-6016	4PDT, 10A	!	!	!	;	0	0.010
GRF		DPDT	0.435	:	0.177	0.941	2	4.596
GRF		3PDT	0.109	!	0.022	0.332		9.170
GRF		3907	0.046	1	0.009	0.140	_	21.740
GRF		6PDT, 10A	:	1,182	:	;	0	0.755
GRF		6PDT, 10A	;	0.303	!	;	0	3.019
GRF	MS25269	6PDT, Hermetic, 5A	! ! ;	:	!!!	}	0	0.057
GRM	MIL-R-39016		1	:		;	0	0.353
GRM	MIL-R-39016	ER, DPOT, 125°C, 1A	1 1	1 4	:	;	0	0.350

PART CLASS: RELAY

TYPE: General Purpose (continued)

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
NA.	SPEC NUMBER		<	604 UPPER	60% CONFIDENCE INTERVAL	HCE INTERVAL	NUMBER	OPERATING
	MANUFACTURER	CHARACIERISTICS	×	CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
GRM	MIL-R-5757	DPDT, 125 ⁰ C, 2A	;	;			0	0.007
GRM	MIL-R-5757	DPDT, 2A	i	;	!	;	0	0.035
GRM		SPST	112.0	;	0.047	0.633	<u></u>	4.742
AIT	MIL-R-6016	4PDT, 125 ^O C, 10A	}	1	:	:	0	0.004
AIT	MIL-R-5016	4PDT, 125 ^o C, 10A	;	:		!	0	0.008
AIT		10A	; ; ;	1.741	1	1 1	0	0.526
AIT	MIL-R-39016	DPDT	0,054	-	0.044	0.066	12	392.000
SHS	MS27401	2PDT, Hermetic	0.287	:	900.0	0.860	7	3.487
SUB	MIL-R-5757	DPDT, 125°C, 2A	1	1	1	;	0	0.018
SUB	MIL-R-5757	6PDT, 125 ^O C, 5A	:	}	1	!	0	0.010
SUB	MIL-R-6016	οροτ, 125 ⁰ c, 10Α	:	1 1	1 1	;	0	0.073
SUB	MIL-R-6016	DPDT, 125 ^O C, 10Α	;	1		;	0	0.029
SUB	MIL-R-6016	DPDT, 125 ⁰ C, 10A	:	1	{	;	0	0.006
SUB	MIL-R-6016	DPDT, 125 ⁰ C, 10A	;	1 1	<u> </u>	;	0	0.015
SUB		DPOT, 2A) 1	!	1	;	0	0.013
SUB	MIL-R-6016	4PDT, 125 ^O C, 10A	;	1	:	ì	0	0.044

PART CLASS: RELAY

TYPE: General Purpose (continued)

			FAILURE R	FAILURE RATE/10 HOURS			
SPEC NUMBER PART NUMBER MANUFACTURER	CHARACTERISTICS	«	601 UPPER SINGLE-SIDED CONFIDENCE		LOWER UPPER	NUMBER	OPERATING HOURS (X 10 ⁶)
MIL-R-6016	4PDT, 125 ^o C, 10A	:	1		:	0	0.009
MIL-R-6016	4PDT, 125 ^O C, 10A	;	!	}	;	0	0.029
MIL-R-6016	4PDT, 125 ^O C, 10A	;	:	;	;	0	0.007
MIL-R-6016	125 ⁰ C	0.500	;	0.099	1.520	_	2.000
MIL-R-6016	125 ⁰ C	;	1.832	;	;	0	0.500

PART CLASS: RELAY

rype: Latching

	_						
	OPERATING	HOURS CX 10 ⁶)	2.000	7.000	.513	23.400	
	NUMBER	FAILED	l l	0	0	_	
	CE INTERVAL	UPPER	1.500	;	}	0.128	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.112	;	!	0.0095	
FAILURE RA	601 UPPER	CONFIDENCE	!	0.131	1.786	:	
	(-		0.500	-	*	0.043	
	CHAPACTEDISTICS	COLLECTION OF THE COLLECTION O	10A	10A	DPDT, 2C Contact Form, Hermetic, Sensitive	4PDT, DC operated	
	SPEC NUMBER PART NUMBER	MANUFACTURER			MIL-R-39016 M39016/9	MS27745	
	ENA		GRF	GRF	GRF	AIT	

PART CLASS: RELAY

TYPE: POWER

1	·						-
	OPERATING HOURS (X 10 ⁶)	1.701	0.829	0.850	0.029	0.029	
	NUMBER FAILED	4	٥.	0	0	0	
	CE INTERVAL UPPER	3,940	5.172	;	!	į	
FAILURE KAIE/10 HOURS	60% CONFIDENCE INTERVAL LOWER UPPER	1.530	0.993	!	:	;	
FAILURE R	60% UPPER SINGLE-SIDED CONFIDENCE	1	!	1.077		<u> </u>	
	«	2,352	2.411	-	;	;	
	CHARACTERISTICS	Heavy Duty Industrial, 115 VAC	Heavy Duty Industrial, 25 VDC	Heavy Duty Industrial, 120 VAC	3PST, Hermetic, 25A	4PDT, Hermetic, 10A, Contact Form 4C	
	SPEC NUMBER PART NUMBER MANUFACTURER				MS24192	MS25271	
	ENA	GRF	GRF	GRF	GRF	GRF	

PART CLASS: RELAY

TYPE: Reed

		T						
	OPERATING	(X 106)	15.500	12.500	8.700	5,109	0.014	
	NUMBER	FAILED	16	59	73	2	0	
	CE INTERVAL	UPPER	1.314	2.761	9.328	0.846	;	
FAILURE RATE/106 HOURS	60% CONFIDENCE INTERVAL	LOWER	0.812	1.953	7.557	0.159	e e e	
FAILURE R	601 UPPER	SINGLE -SIDED CONFIDENCE	;	! ; !	1	:	t I	
		~	1.032	2.320	8.391	0.391	;	
		CHARACTERISTICS	SPST	SPST	DIP, SPST	Dry, 4PST	DPDT, 2A, 125°C	
	SPEC NUMBER	PART NUMBER MANUFACTURER						
		ENV	GRF	GRF	GRF	GRF	GRM	

PART CLASS: RELAY

rvpe: Time Delay

	OPERATING	(X 106)	0.500	
	NUMBER	raileD	0	
	ICE INTERVAL	UPPER	;	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER		
FAILURE R	60% UPPER	CONFIDENCE	1.832	
	⟨•		}	
		CHAKACIERISTICS	SPST, Thermal Time	
	SPEC NUMBER	MANUFACTURER		
	3	À L	SUB	

PART CLASS: SOCKET

type: Pin, DIP

1	_				
	OPERATING	(A 10 ⁶)	1801.200	200.500	
	NUMBER	FAILED		0	
	E INTERVAL	UPPER	0.0017	1 ? 1	
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.00012	6 3 6	
FAILURE RA	60% UPPER	CONFIDENCE	f !	0.0046	
	(*		0.00056	:	
	CHADACIEDICATO	erande len 131303	Formed Phosphor Bronze, Tin Plate	Machined Beryllium Copper, Gold Plate	
	SPEC NUMBER	MANUFACTURER	Circuit Assembly Corp.	Augat	
	Š		GRF	SHS	

PART CLASS: SPRINKLER HEAD

rrpe: General

	OPERATING	HOUPS (X 10 ⁶)	2.488	1.659	52.426				
	NUMBE P	FAIIED	т	-	31	 		 	
	CF INTERVAL	UPPER	2.218	1.808	0.702				
FAILURE RATE/10 ⁵ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.617	0.134	0.500				
FAILURE R	60% UPPLR	SINGLE - SIDEO CONFIDENCE	;	!	!!!				
		<	1.206	0.603	0.591				
		CHARACTERISTICS	Fire Protection 1½ in., 60 GPM	Fire Protection 1 in., 35 GPM	Fire Protection 1/2 in., STD				
	SPEC NUMBER	PART NUMBER MANUFACTURER							
		ENV	GRF	GRF	GRF				

PART CLASS: SWITCH

TYPE: Centrifugal

1		щ,		 	 	
	OPERATING	(X 106)	٦.659			
	NUMBER	FAILED	т	 		7
	CE INTERVAL	UPPER	3.328			
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.926			
FAILURE R	60% UPPER	CONFIDENCE	ļ			
		<	1.808			
		CHARACTERISTICS	Fan Shut-off, Shaft Mtd., 120 VAC			
	SPEC NUMBER	MANUFACTURER				
		A N	GRF			

PART CLASS: SWITCH

_
틍
Ø
_
ء
┒
ē
3
\Box
···
TYPE
~
_

1		1						 			
	OPERATING	(X 10 ⁶)	0.829	0.829	0.829	1.678	0.850				
	NUMBER	FAILED		∞	2	r.	ю	 · ·			
	CE INTERVAL	UPPER	3.617	13.672	5.172	4.715	6,493				
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	0.269	6.723	0.993	1.840	1.807				
FAILURE RA	60% UPPER	CONFIDENCE	:	; ;	;	;	;	•		· •	
	<	۷	1.206	9.645	2.411	2.977	3.529				
		CHARACTERISTICS	Differential, 0.5 - 1.5 IWG, Air	4 PSI, with Panel Light	Differential, 0-100'IWG, Water	Differential, 0-100 ING, Water	Differential, 0-100 IWG, Water				
	SPEC NUMBER	PAKI NUMBER MANUFACTURER									
		E L	GRF	GRF	GRF	GRF	GRF		···		

PART CLASS: SWITCH

TYPE: Flow

_						
) A second	OPERATING HOURS	CX 106)	3.318	5.806	2.488	
	NUMBER	rAILEU	=	82	17	
THE STATE OF THE S	CE INTERVAL	UPPER	4,449	5.794	8.608	
FAILURE KATE/10 HOURS	60% CONFIDENCE INTERVAL	LOWER	2.460	4.036	5.425	
FAILURE RA	60% UPPER SINGLE - SIDED	CONF I DENCE	:	:	!	
	⟨<	$\left. \right $	3.315	4.823	6.832	
	CHARACTERISTICS		Paddle Type, Air Flow 500 FPM, 120 VAC	Paddle Type, Air Flow 500 FPM, 120 VAC	Paddle Type, Air Flow 500 FPM, 120 VAC	
SPEC NAMES	PART NUMBER	MANUFACTURER				
	ENA	1	GRF	GRF	GRF	

PART CLASS: SWITCH

TYPE: Humidity

	OPERATING	HOURS (X 10 ⁶)	0.238
	NUMBE R	FAILED	4
	CE INTERVAL	UPPER	28.099
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	9.629
FAILURE RA	60% UPPER	SINGLE - SIDED CONFIDENCE	
		<	16.775
		CHARACTERISTICS	Type HT, Wallmounted, Adjustable, 120 VAC
	SPEC NUMBER	PART NUMBER MANUFACTURER	
		2	GRF

PART CLASS: SWITCH

TYPE: Push Button

				FAILURE R.	FAILURE RATE/10 ⁶ HOURS			
ENV	SPEC NUMBER PART NUMBER	CHARACTERISTICS	(4	601 UPPER	60% CONFIDER	60% CONFIDENCE INTERVAL	NUMBER	OPERATING
	MAWFACTURER		- 1	CONF IDENCE	LOWER	UPPFR	FAILED	(×106)
GRF	S088-S-11M	4pST	0.218		0.043	0.662		4.590
GRF	MIL-S-8805	4PST	; ;	0.088	!	:	0	10.400
GRF	MIL-5-22885		;	1	!	;	0	0.218
GRF	MIL-S-22885	SPST, 5A	\$ 1	!	1	1	0	0.135
GRF	MIL-S-22885	Illuminated	; 1	1		;	0	0.010
GRF		Push On-Push Off, Snap in mount, 30 or 115VDC at 2A Res., 1A Induc- tive Actuation = 100,000, Lighted	3.160	!	2.057	4.793	9	1.899
GRF	MS25089	Pushbutton Switch, 2PDT Push-Pull Operation, Dustproof Construction, 125VAC at 10A RES.	!	!	:	<u> </u>	0	0.028
GRF	MS25089	Pushbutton Switch, 2PDT Momentary Operation, Dustproof Construction, 28VDC at 10A RES.	!		!		0	0.029
GRM	MIL-S-8805	4PST, 4A	1		i !	¦	0	0.007
GRM	701222 C.P. Clare		;	;	!		0	0.298
GRM	701222 Clare Pendar		1	;	;	! !	0	0.301
ΑΙ		4PDT, 5A, 28VDC	2.28	1	0.508	6.840	<i>-</i>	0.439
SUB	MIL-S-3950	5A	-	-		!	0	0.029

PART CLASS: SWITCH TYPE: Reed

	OPERATING	HOURS (X 10 ⁶)	0.964	0.908				
	NUMBER	FAILED	0	0				
	ICE INTERVAL	UPPER		1				
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER		!				
FAILURE R	601 UPPER	SINGLE -SIDED CONFIDENCE	0.950	1.009				
	4		;	!				
		CHARACIERISTICS	SPST	SPST				
	SPEC NUMBER	FAKT NUMBER MANUFACTURER	MIL-S-55433 MRR-2 Hamlin	M1L-S-55433 MRR-2 Hamlin				
	24		DOR	SAT				

PART CLASS:

SWITCH Rotary

TYPE:

				FATHURE	FATITION DATE / 1 A G. Maine		<u></u>	
	SPEC NUMBER							
EN.	PART NUMBER	CHARACTERISTICS	⟨ <	SINGLE-SIDED	1	SOL CONFIDENCE INTERVAL	NUMBER	OPERATING
	PANOTAL LUKER			CONF IDENCE	LOWER	UPPER	FAILED	(X 10 ⁶)
GRF	MIL-S-3786		0.218	1	0.043	0.662	-	4.590
GRF	MIL-S-3786		i	-	1 1		0	0.021
GRF	12L22 Digitran		!	-	4 3 f	;	0	0.241
GRF	67-1950 JANCO		1 1	1	;	;	0	0.069
GRM		l Deck, l Pole, 3 POS	:	!	;	;	0	0.014
GRM		1 Deck, 1 Pole, 4 POS	!	:	1 1 2	i :	0	0.014
GRM		1 Deck, 2 Pole, 5 POS	:	1	;		0	0.007
GRM		l Deck, l Pole, 5 POS	;	-	;	1	0	0.007
GR.		l Deck, l Pole, 7 POS	!	1	}	:	0	0.014
GRM		1 Deck, 1 Pole, 8 POS	;	:	;	!	0	0.028
GRM		5 Deck, 1 Pole, 9 POS		!	;	;	0	0.007
GRM		1 Deck, 1 Pole, 11 POS	:	;	3 6	;	0	0.007
AI	M1L-S-3786 M3786/20-089 M3786/20-093	6 Position & 10 Position, 1/5 A, 28 VDC	;	1	!	!	0	0.017
AIT	MIL-S-3786	4P, 3 POS 6P, 2 POS	;	0.205	;	:	0	4.460
7								

PART CLASS: SWITCH

TYPE: Sensitive

				FAILURE R	FAILURE RATE/10 ⁶ HOURS		,	
	SPEC NUMBER			601 UPPER	60% CONFIDENCE INTERVAL	NCE INTERVAL	NUMBER	OPERATING
Ž.	PART NUMBER MANUFACTURER	CHARACTER I ST I CS	~	SINGLE -SIDED CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
DOR	MIL-S-8805	SPDT, 75 ⁰ - 125 ⁰ F		-	•	•	0	0.193
	Micro Switch				-			
GRF		125 VDC, SPDT, 2 oz Operating Force	5.249	:	2.163	11.260	2	0.381
GRF		120 VAC, SPDT	12.812	!	6.560	23.575	٣	0.234
GRF		120 VAC, SPDT	4.737	1	3.302	6.768	<u></u>	1.689
GRF		120 VAC, SPDT	5.591	1	4.260	7.346	13	0.233
GRF		120 VAC, SPDT	7.857	:	4.856	12.446	ς.	0.636
GRF		2PDT, Push-Pull Oper., Dustproof, 28VDC at 10A RES.	.264	i !	.109	.566	8	7.584
					-			
					-			
7								

PART CLASS: SWITCH

4		٠
1		
9	2	2
1	į	
	•	;
į		
•		
	•	٠
		÷
	þ	•

_					·	 			 	
OPERATING	HOURS (X 10 ⁶)	1.659	0.829	1,659	0.004					
42070	FAILED	4	2	4	0			-		
CE INTERVAL	UPPER	4.039	5.172	4.039	1					
60% CONFIDENCE INTERVAL		1.384	1,993	1.384						
601 UPPER	SINGLE-SIDED CONFIDENCE		;	1	}					
	(4	2.411	2.411	2.411	; e ;					
	CHARACTERISTICS	Remote Bulb, 30°-110°F, SPDT, 24 VDC	Bi Metal, 55 ⁰ -85 ⁰ F, 24 VDC, SPDT	Bi Metal, 55 ⁰ -85 ⁰ F, 24 VDC, SPDT						
SPEC NUMBER	PART NUMBER MANUFACTURER	49-13521	T-302	1-28013	IL-24236					
	EN	GRF	GRF	GRF	AI					

PART CLASS: SWITCH

TYPE: Thumbwheel

				FAILURE R	FAILURE RATE/106 HOURS			
FNV	SPEC NUMBER	201040404	(4	601 UPPER	60% CONFIDENCE	ICE INTERVAL	NUMBER	OPERATING
	MANUFACTURER	UMMALIENISTICS	<	CONFIDENCE	LOWER	UPPER	FAILED	HOURS (X 196)
GRM	8-L-116 Digitran			;	;	;	0	0.014
GRM	8-L-126 Digitran		;	;	1	;	0	0.028
GRM	9-L-34 Digitran		!	! !	!	;	0	0.069
GRM	9-L-41 Digitran		i ;	:	i !	:	0	0.007
GRIM	9-L-45 Digitran			!!	 	;	0	0.007
GRM	9-L-46 Digitran) -	! !	:	;	0	0.076
GRM	9-L-48 Digitran		!	i !	; ;	1	0	0.021
GRM	9-L-49 Digitran		t 1 t	i i	1	-	0	0.021
GRM	9-L-51 Digitran		<u> </u>	!	!!!	;	0	0.014
GRM	9-L-52 Digitran		:		•	!	0	0.007

PART CLASS: SWITCH

TYPE: Thumbwheel (continued)

	Γ-	_		··· <u> </u>	 	 		 	 	
	OPERATING	HOURS (X 10 ⁶)	0.014	0.189						
	NUMBER	FAILED	0	т						
	ICE INTERVAL	UPPER	1	29.175						
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	LOWER	-	8.118					 	
FAILURE R	60% UPPER	CONFIDENCE	1	!						
		~		15.860						
		CHARACTER I ST I CS		12 and 16 position						
	SPEC NUMBER	PART NUMBER MANUFACTURER	9-L-53 Digitran							
		ENA	GRM	AIT	 		, <u>, , , , , , , , , , , , , , , , , , </u>		 	

PART CLASS: SWITCH TYPE: Toggle

				FAILURE R	FAILURE RATE/106 HOURS			
27.5	SPEC NUMBER		(4	601 UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
	MANUFACTURER	CHARACTERISTICS	<	SINGLE - SIDED	LOWER	UPPER	FAILED	HOURS (X 10 ⁶)
GRF	MIL-S-3950	Environmentally Sealed		! !	1	:	0	0.083
GRF	MIL-S-3950	Environmentally Sealed		i	!	;	0	0.042
GRF	MIL-S-3950	Environmentally Sealed	;	i ; i	!	!	0	0.010
GRF	MIL-S-8834	5A	;	!		;	0	0.177
GRF	MIL-S-8334		!	0.239	;	;	0	3.840
GRM		SPST, 5A	;	1	į	;	0	0.167
GRM		DPDT, 5A	;	;	;	;	0	0.083
GRM		0PDT, 5A	:	1	;	*	0	0.007
GRM	MIL-S-8834	DPDT, 25A	;	:	;	; ;	c	0.12
AI	MIL-S-8834 MIS90310-231	SPDT, 4A, 28 VDC	116.000	t ;	59,535	213,953	ю	0.026
AI	MIL-S-8834 MS90311-211	SPDT, 4A, 28 VDC] ;]	;	!	;	0	0.052
AI	MIL-5-8834 MS90311-231	SPDT, 4A, 28 VDC	;	;	!	:	0	0.017
				1	han-11-1			

PART CLASS: SWITCH

TYPE: Toggle

	OPERATING	HOURS (X10 ⁶)	0.684	1.029	3.165	0,498
·	NUMBE R	FAILED	0	0	0	0
	ICE INTERVAL	aaljn	;	;	;	;
FAILURE RATE/10 HOURS	60% CONFIDENCE INTERVAL	LOWFR		!	1	!
FAILURE R	60% UPPER	CONFIDENCE	1.339	0.892	0.289	1.839
	«	۷	}	}	}	
		CHARACIERISTICS	2PDT, Momentary Oper., Dustproof Construction, 28VDC at 28A RES.	2PDT, 2 Position Oper., Dustproof Construction, 28VDC at 20A RES.	2PDT, 2 Position Oper., Dustproof Construction, 28VDC at 5A RES.	1PST, Momentary Oper., Dustproof Construction, 28VDC at 8A RES.
	SPEC NUMBER	PAKI NUMBEK MANUFACTURER	MS35059	MS35059	MS90311	MS35059
	274		GRF	GRF	GRF	GRF

PART CLASS: TIME-TOTALIZING METER

TYPE: Timers, Electro-Mechanical

				FAILURE	FAILURE RATE/10 ⁶ HOURS			
ENV	SPEC NUMBER PART NUMBER MANUFACTURER	CHARACTERISTICS	(4	601 UPPER SINGLE-SIDED CONFIDENCE		60% CONFIDENCE INTERVAL LOWER UPPER	NUMBER	OPERATING HOURS (X 10 ⁶)
GRF		Elapsed Time, 1 Phase 120v, 60HZ	42.210		30.141	58.630	6	0.213
GRF		Clock	42.850	1	34.190	53.560	18	0.420
GRM		Clock	95.230	:	39.240	204.290	2	0.021
AI		Clock	1338.000	{	1211.136	1482.112	79	0.059
		Clock	45,450	í !	28.090	72.000	2	0.110
		Clock	194.600	t 1	184.100	205.200	255	1.310
AU AU		Clock	372,700	g 	360.800	385.900	1075	2.884
HEL		Clock	86.360	f 1 1	69.610	107.270	19	0.220
SHS		Elasped Time	:	f 1	;	:	0	0.230
								

PART CLASS: VALVE

General
TYPE:

				FAILURE RA	FAILURE RATE/106 HOURS			
	SPEC NUMBER			601 UPPER	60% CONFIDENCE	HE INTERVAL	MUMBER	OFERATING
Ş.	PART NUMBER MANUFACTURER	CHARACTERISTICS	κ	CONFIDENCE	LOWER	UPPER	LVILED	(x 10 ⁶)
GRF		Ball - 1 in., 250 lb., SCRD Stainless Steel Body	1.441	;	0.891	2.283	r.	3.469
GRF		Butterfly - 3 in., 150 lb., Wafer Type, Steel	3.617	;	1.852	6.655	က	0.829
GRF		Butterfly, 3 in., 150 lb., Wafer Type, Steel	1.206		0.269	3.617	_	0.829
GRF		Check - Swing, 2 in., 150 lb., FLGD	2.399	-	1.483	3.800	ς,	2.084
GRF		Check - Swing, 2 in., 150 lb., FLGD	2.858	1	1.464	5.260	м	1.050
GRF		Check - Swing, 2 in., 200 lb., FLGD	2.873	:	2.051	3.990	6	3.133
GRF		Check - Swing, 1/2 in., 200 lb., SCRD	1.206	:	0.269	3.617	<u></u>	0.829
GRF		Check - Swing, 1/2 in., 200 lb., SCRD	5.997	!	3.904	6,905	9	١.00 ٢
GRF		Check - Swing, 1 in., 150 lb., SCRD	2.880	!	1.475	5.300	ю	1.042
							1	

PART CLASS: VALVE

TYPE: General (continued)

				FAILURE R	FAILURE RATE/10 ⁶ HOURS			
	SPEC NUMBER		<	601 UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
E K	PART NUMBER MANUFACTURER	CHARACTER I ST I CS	۲	CONFIDENCE	LOWER	UPPER	LAILED	(X 10 ⁶)
GRF		Check - Swing, 1 in., 150 lb., SCRD	6.028	;	3.725	9.549	2	0.829
GRF		Diaphragm l in., 150 lb., SCRD, Stainless Steel Body	2.411		1.008	5.172	2	0.829
GRF		Diaphragm - 150 PSIG, Water	1.205	;	0.497	2.586	~	1.659
GRF		Diaphragm - 20 PSIG, Pneumatic	3.829	:	2.669	5.428	80	5.089
GRF		Diaphragm - 3 way, Water Temp. Control	;	!	;	;	۵	0.124
GRF		Fixed Flow Control - 1/2 in., Air	13.632	!	6.980	25.083	m	0.220
GRF		Fixed Flow Control - 1/2 in., Air	;	1	;	;	0	0.321
GRF		Gate - 2 in., 200 lb., SCRD	1.920	i i	1.102	3.216	4	2.083
GRF		Gate - 1 in., 200 lb., SCRD Bronze Body	1.206	!	0.497	2.586	2	1.659
GRF		Gate - 1/2 in., 2001b. SCRD Bronze Body	0.603	;	0.134	1.808	-	1.659

PART CLASS: VALVE

TYPE: General (continued)

				FAILURE R.	FAILURE RATE/10 ⁶ HOURS			
	SPEC NUMBER			60% UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
C II	PART NUMBER MANUFACTURER	CHARACTERISTICS	٧	CONFIDENCE	LOWER	UPPER	FAILED	(X 10 ⁶)
GRF		Gate - 3 in., 150 lb., FLGD Steel	1.440	1	0.737	2.650	т	2.083
GRF		Globe - 2 in., 175 lb., SCRD	1.206	!	0.269	3.617	_	0.829
GRM		Globe - 1 in., 200 lb., SCRD Bronze Body) [1.104	1	;	0	0.829
∢		Hydraulic - 4 way Spool	463.700) 	414.200	520.500	64	0.138
⋖		Hydraulic – 3 way Spool	35.211	!	55.669	48.028	10	0.284
AUT		Hydraulic - 3 way Spool	:	† !	1	!	0	0.212
AU		Motor Driven - Fuel	47.850	:	38.450	59.450	19	0.397
GRF		Needle - 1/4 in., 3000 PSI, Steel	1.690	! !	0.696	2.898	2	1.183
GRF		Needle - 1/2 in., 3000 PSI, Steel	1.206	!	0.617	2.218	က	2.488
GRF		Plug - 1/2 in., 150 lb., SCRD, Steel w/stainless steel plug	1.219	!	0.272	3.657	-	0.820

PART CLASS: VALVE

TYPE: General (continued)

				FAILURE R	FAILURE RATE/10 HOURS			
3	SPEC NUMBER		<	60% UPPER		60% CONFIDENCE INTERVAL	NUMBER	OPERATING
Ž		CHARACTER I ST I CS	<	CONFIDENCE	LOWER	UPPER	FAILED	MOURS (X 10 ⁶)
GRF		Plug - 1/2 in., 150 lb., SCRD, Steel w/stainless steel plug	3.840	;	2.204	6.433	4	1.042
GRF		Plug - 1 in., 150 lb., SCRD, Steel w/stainless steel plug	696.0	;	0.216	2.908	-	1.032
GRF		Plug - 2 in., 300 lb., SCRD, Steel W/stainless steel plug	1.206	;	0.269	3.617	_	0.829
GRF		Plug - 2 in., 300 lb., SCRD, Steel W/stainless steel plug	5.761	!	4.338	7.614	12	2.083
GRF		Relief - 3/4 in., 150 lb., Set 80 PSI, 56 PM	2.411	;	0.993	5.172	2	0.829
GRF		Relief - 3/4 in., 150 lb., Set 80 PSI, 56 PM	1.568	:	0.350	4.705	,	0.638
GRF		Relief - 3/4 in., 150 lb., Set 80 PSI, 56 PM	1.206	1	0.269	3.617	_	9.829
GRF		Relief - 1/2 in., 150 lb., Set 85 PSI, 20 SCFM	1.308	:	0.926	3.328	ю	1.659

PART CLASS: VALVE

TYPE: General (continued)

\$\hat{S}\$ simple convergence interval 604 Convergence (order of the per convergence of the per co					FAILURE R	FAILURE RATE/10 ⁶ HOURS			
10.331 2.693 4 0.340 1.772 2 3.490 12.542 3 4.924 17.697 3	SPEC NUMBER	4170		«	60% UPPER		NCE INTERVAL	NUMBER	OPERATING
0.331 2.693 4 0.340 1.772 2 3.490 12.542 3 4.924 17.697 3	MANUFACTURER CHARACTERISTICS	CHARACTERISTICS		<	CONFIDENCE		UPPER	FAILED	HOURS (X 106)
0.331 2.693 4 0.340 1.772 2 3.490 12.542 3 4.924 17.697 3	Vent - 3/4 in., Float operated tank vent	Vent - 3/4 in., Float operated tank vent			!	}	! !	0	0.321
0.340 1.772 2 3.490 12.542 3 4.924 17.697 3	Solenoid - 2 in., 380 PSI, 2 way, shuttle	Solenoid - 2 in., 380 PSI, 2 way, shuttle	41) †)	0.331	2.693	4	2.488
3,490 12.542 3 4,924 17.697 3	Solenoid - 1/2 in., 4 way, 3 POS. shuttle	Solenoid - 1/2 in., 4 way, 3 POS. shuttle		0.826	:	0.340	1.772	2	2.421
4.924 17.697 3	Solenoid - 1/2 in., 110V, Refrigerant.	Solenoid - 1/2 in., 110V, Refrigerant.		6.816	1 4	3.490	12.542	ю	0.440
	Solenoid - 3/8 in., 150 lb., 110V, Air	Solenoid - 3/8 in., 150 lb., 110V, Air		9.618	!	4.924	17.697	т	0.312

NONELECTRONIC PART RELIABILITY DATA

SECTION 3

NONELECTRONIC PARTS DATA FROM COMMERCIAL EQUIPMENT APPLICATIONS

Section 3

NONELECTRONIC PARTS DATA FROM COMMERCIAL EQUIPMENT APPLICATIONS

The detailed data presented in this section have been selected and grouped on the basis of direct applicability to electronic data processing, point of sales and test equipments. Data from these areas have proven to be limited and have been grouped in this section in order to improve visibility for the user of the databook. The environmental codes described on page 5 are utilized in this section.

The user should take care to note the terms in which the failure data are given, i.e., hours or cycles, since this is a variable in this section. An asterisk (*) to the right of the data line is provided to alert the user to note that the column headings are in cycles.

INDEX FOR COMMERCIAL EQUIPMENT APPLICATION DATA

	Page
Teflon Sleeve Bearing	215
Bearing (Pair)	215
Belt	215
Ceramic Bushing and Spring	216
Spring Clutch	216
Memory Disk	217
LED Display, 7 Segment	217
LED Display, Dot Matrix	218
Fan	220
Vacuum Fan	220
Gear	221
Magnetic Tape Head	221
Motor	221
Relay	222
General Purpose Relay	222
Keyboard Switch	223
Key Push Button Switch	224
Push Button Switch	225
Rocker Switch	225
Toggle Switch	226
Switch	227

COMMERCIAL EQUIPMENT APPLICATION DATA TABLES

					•	
		FAILURE R	FAILURE RAIF/10 ⁶ HOURS			
	<	60% UPPER	60% COMFIDENCE THERVAL	F INTERVAL	NUMBE R	OPERATING
PART DESCRIPTION	K	STNGTE-STDED	LOWER	UPPER	FAILED	HOURS (X10 ⁶)
PART: Teflon Sleeve Bearing	14.180		12.813	15.862	73	5.148
APPLICATION: Tape Guide, Magnetic Tape Unit						
APPLICATION CONDITIONS: GRF (45°C Internal)						
FAILURE MODES: Erratic Movement Worn						
PART: Bearing (Pair)	13.985	!	986.6	19.424	6	0.644
APPLICATION: Capstan, Magnetic Tape Unit			-			
APPLICATION CONDITIONS: GRF (45°C Internal)						
FAILURE MODES: Nofsy, Worn						
PART: Belt	41.956	\$ † 4	35.050	50.385	27	0.644
APPLICATION: Capstan Drive, Magnetic Tape Unit						
APPLICATION CONDITIONS: GRF (45°C Internal)						
FAILURE MODES: Worn, stretched, broken						

PART DESCRIPTION		FAILURE RA	RATE/10 HOURS			
		60% UPPER	60% CONFIDENCE	CE INTERVAL	NUMBER	OPERATING HOLLDS
		CONFIDENCE	LOWER	UPPER	FAILED	(×10 ⁶)
PART: Belt 0.4	0.456	-	0.419	0.498	106	232.406
APPLICATION: Data Entry, Data Preparation Equipment	••	-				
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
PART: Ceramic Bushing and Spring 33.4	33.409	;	29.060	38.290	43	1.287
APPLICATION: Tape Guide, Magnetic Tape Unit						
APPLICATION CONDITIONS (45°C Internal)	· · · · · · · · · · · · · · · · · · ·					
FAILURE MODES: Worn Bushing, Spring Tension Lost		- 				
PART: Spring Clutch 0.59	0.594	i i	0.572	0.619	478	804.347
APPLICATION: Data Entry, Preparation Equipment						
APPLICATION CONDITIONS: GRF			 ,			
FAILURE MODES:	 -					

		FALLURE	FALLURE RATE/10 B HOURS			
			60% CONFIDENCE	, T. INTERVAL		
"ART DESCRIPTION	<<	SINGLE - SIDED CONFIDENCE			NUMBER FALLED	HOURS (x10 ⁶)
PART: Memory Disk	0.148	:	0.033	0.444	1	6.760
APPLICATION:						
APPLICATION CONDITIONS: DOR						
FAILURE MODES:						
PART: LED Display, 7 Segment, 1 Character	0.226	!	0.214	0.238	258	1141.741
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF	•					
FAILURE MODES:						
PART: LED Display, 7 Segment, 4 Character	0.146	1	0.0325	0.437	r	6.864
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						

		FAILURE R	FAILURE RATE/10 F HOURS			
	•	601 UPPER	60% CONFIDENCE	CF INTERVAL	MBI	OPERATING
FART DESCRIPTION	⟨ ⋖	SINGLE -SIDED CONFIDENCE	LOWFR	UPPER	LAHED	HOURS (X10 ⁶)
PART: LED Display, 7 Segment, 5 Character	0.114		0.077	0.166	^	61.529
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
PART: LED Display, 7 Segment, 9 Character	!	1.559	!	; ;	0	0.588
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
PART: LED Display, Dot Matrix, 1 Character	0.163	1 6 1	0.137	0.193	53	178.303
APPLICATION: Test Instruments		·				
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						

					-	
		FAILUPE R	FATEUPE RATE/10 ⁰ TOURS			
INCLINITION NO TRANS	· ·	60% ปรากา	60% CONFIDENCE	CF INTERVAL	P JAMUN	OPEPATING
PART UESCRIPTION	<	CONFIDENCE	d iAtti i	andan	r A J3 CD	HOURS (*10 ⁵)
PART: LED Display, Dot Matrix, 3 Character	!	7.190	!	;	0	0.127
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
PART: LED Display, Dot Matrix, 4 Character	0.962	!	0.214	2.885	_	1.040
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
PART: LED Display, Dot Matrix, 5 Character	!	0.157	ë i	1 1 1	0	5.829
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
			-			
	1	1	T			

		FAILURF R	FAILURE RATE/10 ⁶ HOURS			
	<	601 UPPER	60% CONFIDENCE INTERVAL	CE INTERVAL	NUMBER	OPERATING
PART DESCRIPTION	~	SINGLE - SIDED CONFIDENCE	LOWFR	UPPER	FAHED	HOURS (×10 ⁶)
PART: LED Display, Dot Matrix, 6 Character	1.095	:	0.891	1.345	21	19.175
APPLICATION: Test Instruments						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
					-	
PART: Fan	0.312	3	0.274	0.356	49	156.952
APPLICATION: Data Entry, Preparation Equipment						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						
PART: Vacuum Fan	12.431	1	8.665	17.662	80	0.644
APPLICATION: Magnetic Tape Unit						
APPLICATION CONDITIONS: GRF (45°C Internal)						
FAILURE MODES: Bearings Worn, Noisy						

		FAILURE R	FAILURE RATE/10 ⁶ HOURS			
PART DESCRIPTION	⟨≮	60% UPPER SINGLE - SIDED CONFIDENCE	60% CONFIDENCE LOWER	CE INTERVAL. UPPER	NUMBER	OPERATING HOURS (X10 ⁶)
PART: Gear	0.169	-	0.130	0.218	14	83.067
APPLICATION: Data Entry, Preparation Equipment						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:	•					
PART: Magnetic Tape Head	43.510	1	36.479	52,184	82	0.644
APPLICATION: Magnetic Tape Head						
APPLICATION CONDITIONS: GRF (45°C Internal)						
FAILURE MODES: Signal Distortion, Head Worn						
PART: Motor	1.499	! !	1.401	1.619	154	102.789
APPLICATION: Data Entry, Preparation Equipment						
APPLICATION CONDITIONS: GRF						
FAILURE MODES:						

I A I I. URE RATE / 10 ⁶ HOURS	60% UPPER 60% CONFIDENCE INTERVAL	A SIMPLE TOWER UPPER FALLED HOURS CONFIDENCE LOWER UPPER (X106)	2.693 2.591 2.806 488 181.208				s 0.00107 0.000904 0.00128 29 27000.000*				
			PART: Relay 2.693	APPLICATION: Data Entry, Preparation Equipment	APPLICATION CONDITIONS: GRF	FAILURE MODES:	PART: General Purpose Relay 0.00107 Silver or Gold Bonded Contacts	APPLICATION: Medical Electronics	APPLICATION CONDITIONS: GRF	FAILURE MODES: Fatigue of Swinger 7 Contact Resistance 9 Contact Bounce Greater than 30 Milliseconds 13	

		FAILURE R	RAIF/105 HOUPS			
	(60% UPPER	60% COUFTDENCE	F INTERVAL	a Jawith	OPERATING
PART DESCRIPTION	Χ .	SINGLE - SIDED CONFIDENCE	OWF B	UPPER	FAFLFU	HOURS (X105)
PART: General Purpose Relay 10A, 25VDC Contact Res. Initial 0.05 Ω Contact Res. After Life Test 0.10 Ω	2.115	:	1.570	2.838	[[5.200*
APPLICATION: Electronic Data Processing						
APPLICATION CONDITIONS: Test, 10 ⁵ cyc each						
FAILURE MODES: Mechanical 1 at 18,000 cyc Electrical 10						
PART: Keyboard Switch	0.0622	:	0.0522	0.0744	58	450,000*
Colorado Instruments Gold Contacts, 10A, 28VDC, 0.2n 90GM Force; 0.080 in. Pretravel, 0.020 in. Overtravel			,			
APPLICATION: Point-of-sale Equipment						
APPLICATION CONDITION: Test, 30 cyc per minute						
FAILURE MODES: Contact Miss 19 Spring Fatigue 7 Broken Actuator 2						

FAILURE RATE/10 ⁶ HOURS	608 CONTIDENCE INTERVAL	Switch cal Products cal Products caspoint Contacts cating Life	telligent Terminal	act 3 rn Spring 3 stor Stem 1	Sutton Switch 2.317 1.508 3.514 n at 6VDC & 100mA al - 100,000 cyc al - 25,000 cyc	ITIONS: GRF
	PART DESCRIPTION		APPLICATION: Intelligent Terminal APPLICATION CONDITIONS: GRF (35°C - 40°C Internal)		100mA cyc cyc	Processing APPLICATION CONDITIONS: GRF

		FAILURE R	FAILURE RATE/10 ⁶ HOURS			
	<	60% UPPER	60% CONFIDENCE INTERVAL	CE INTERVAL	NUMBER	OPERATING
PART DESCRIPTION	٧	CONFIDENCE	LOWER	UPPER	railed	HOURS (X10 ⁶)
PART: Push Button Switch Contacts - Silver Plate; Contact Resistance Initial 0.0150 at 2A, 30VDC; After Life Test 0.0300	3.000	:	1.953	4.550	9	2.000*
APPLICATION: Electronic Data Processing						
APPLICATION CONDITIONS: Test					•	
FAILURE MODES: Contact Resistance 6						
PART: Rocker Switch C&K Components - 5101, 5103, 5108	!	0.916	i	:	0	1.000
APPLICATION:						
APPLICATION CONDITIONS: Test 105 cyc each 15 cyc per minute; duty cycle - 1 sec. on, 3 secs. off; resistive load, 20mA, 20VDC						
FAILURE MODES:						

		FALLURE R	FAILURE RATE/10 ⁶ HOURS			
	(60% UPPER	60% CONFIDENCE	CE INTERVAL	NUMBER	OPERATING
PART DESCRIPTION	ζ.	SINGLE - SIDED	LOWER	UPFER	FATLED	(×106)
PART: Toggle Switch OAK-12A-2B1-1AO	4.158	1	1.713	8.919	2	0.481*
APPLICATION: Electronic Data Processing						
APPLICATION CONDITIONS: Test 105 cycles each at 18 cycles per minute; 20mA, 20VDC, resistive load						
FAILURE MODES: Actuator Broken 1 Contacts Pitted 1						
PART: Toggle Switch Contact Resistance Initial - 0.01g at 30VDC; Contact Bounce - 6 milliseconds at 0.1A, 4VDC	1.479	:	0.330	4.438		0.676*
APPLICATION: Electronic Data Processing						
APPLICATION CONDITIONS: Test						
FAILURE MODES: Mechanical 1 @ 20,369 cycles						

	OPERATING	HOURS (X10 ⁶)	774.613						- 47 -			
	NUMBER	FAILED	21096							 		
	CE INTERVAL	UPPER	27.779									
FAILURE RATE/10 ⁶ HOURS	60% CONFIDENCE INTERVAL	; OWER	26.771									
FAILURE RA	60% UPPER	STNGLE - SIDED CONFIDENCE					 					
		٧.	27.234									
		PART DESCRIPTION	PART: Switch	APPLICATION: Data Entry, Preparation Equipment	APPLICATION CONDITIONS: GRF	FAILURE MODES:						

NONELECTRONIC PARTS RELIABILITY DATA

SECTION 4

FAILURE MODES AND MECHANISMS

OPERATIONAL FAILURE MODES AND MECHANISMS

The following discussions provide information which serves to identify the major problem areas associated with the failures of certain nonelectronic parts under operational conditions. To a limited extent, guidelines are provided for limiting the failure modes identified.

Batteries

There are two basic types of batteries, primary and secondary. Primary batteries are nonrechargeable, discarded when the energy runs out. Secondary batteries are rechargeable batteries and can be used time and time again. This discussion is limited to specific secondary batteries such as lead-acid and nickel-cadmium.

Lead-Acid Batteries

Lead-acid systems are not new; they have not been used widely in electronic systems because of packing problems, their weight and size, and the danger of acid leakage. The newly developed gelled lead-acid system, however, has overcome most of the drawbacks of its predecessor (except packaging inadequacies), but it is new and not yet in great supply and usage.

Lead-acid batteries have one area which greatly affects their useful life, the recharge cycle. Recharging efficiency is a function of temperature and charge rate. To properly recharge many secondary batteries the charge rate must be tapered with time. Not doing so shortens the life of the battery and can lead to overcharging. In lead-acid batteries, overcharging will cause the generation of gases (H2 and O2) within the cell to dangerously high levels. Though almost all lead-acid batteries have venting techniques to allow the gases to escape and thereby reduce cell pressure, the loss of these gases can greatly reduce the life of the cell. Several manufacturers of lead-acid batteries utilize a separate compartment to recombine the gases into water via a catalyst. This is done at the expense of compactness. In the worst case, if the gases are not vented or are vented at too high a pressure, the cells will explode.

Charging, and especially overcharging, also causes the battery cells to generate heat. It should be noted that many rechargers use this condition to increase the tapering of the charge rate and so reduce the possibility of overcharging.

Other reliability considerations lie in the packaging and basic design of lead-acid cells. Examining packaging first, it is incorrect to assume that any battery is hermetically sealed. Corrosion can be found on lead-acid cells that have never been used and have been left in storage. Lead-acid batteries have been known to leak acid either through the case itself or through the terminal seals.

The basic design of the lead-acid battery is also responsible for several problems. The nature of the lead-acid system does not lend itself well to being packaged in a cylindical package. This tends to lower the energy density per cell and also to cause the package failures mentioned previously.

Nickel-Cadmium Batteries

The charging information stated for lead-acid can be applied to the nickelcadmium. There is also specific information which only applies to the nickelcadmium.

Memory effect is a reversible failure mode that causes a nickel-cadmium battery to fall below its rated performance because of certain modes of operation. It is caused by repetitive discharge to a shallow depth. A nickel-cadmium battery repeatedly discharged only 25% (75% of charge unused) and then fully recharged will, after 50 or more of such cycles, deliver 25% of its rated capacity when a deep discharge is then attempted. A nickel-cadmium battery exhibiting memory effects can be restored to normal capacity simply by deep discharging it and then fully recharging it. Memory effect is not a problem when the battery is subjected to random depths of discharge or is overcharged for random periods of time. It occurs only when a precise, repetitive pattern of shallow discharge and full recharges is followed. This is not a prevalent problem in all NiCd battery systems but is the product of several design techniques.

Cell polarity reversal is another hazard of the NiCd battery. If a battery (consisting of several cells in series) is discharged to too low a level and one or more of the composing cells is completely depleted of charge, there is the chance that the depleted cell's polarity may reverse. In this instance, the reversal cell would accept a charge from the remaining charged cells, generate internal heat and pressure, and destroy the battery.

Chemical breakdown of the nylon separator is the most frequent failure of nickel-cadmium batteries. Oxygen produced continuously while the cell is in an overcharge mode reacts with the nylon; as a result, a NiCd cell at 50°C has a useful life about half that at 40°C. NiCds for emergency power are almost always run in such a continuous low-rate overcharge mode.

Conclusions

Part level failure problems associated with batteries can be lumped under four basic categories: catastrophic short; catastrophic open circuit; deviations in electrical performance; and mechanical anomalies. The most predominant failure mode is a mechanical anomaly, leakage from a cell seal.

System level failures in charge control or thermal design, while not caused by the battery, may be falsely interpreted as a defect in the battery.

Bearings

The predominate failure modes of bearings are related to their lubrication. Much emphasis has been placed on the study of bearing fatigue life and reliability and the types of lubrication systems used to enhance long life, since bearings are acknowledged as the life-limiting elements of most motors. To reach the longest motor life possible, bearing wear must be reduced to a minimum, usually by the application of lubricants. The selection of lubricants is almost always a compromise, since there are so many significant characteristics to consider. Some of the important application considerations include: operating temperature range,

oxidation and thermal stability properties, type of environment, evaporation rate, and viscosity. Depending on the specific application certain tradeoffs are inevitable, as in the case of silicon, which has an excellent viscosity index rating but poor boundary condition lubrication.

The failure mechanisms of bearings usually result in the reduction of lubrication. These mechanisms include: excessive bearing load, excessive temperature, bearing misalignment, brinnelling (plastic deformation of raceways), fretting corrosion, contamination of raceways (gear wear debris, brush wear debris, corrosion products), evaporation or migration of lubricant, high viscosity (operating temperature lower than anticipated) and spalling or galling.

Circuit Breakers

The function of a circuit breaker is to protect electrical circuitry by acting as a manual switch that can open itself under overload conditions. The major circuit breaker problem is mechanical failure due to the complexity of some activation mechanisms. Contamination caused by the formation of oxides or loose metal particles is also a problem and could result in an open or short condition. Contact corrosion due to external impurities (such as solder resin, body oils, sulfides, or wire lubricants) can also create the same condition. Poor process control can cause deformed, loose, or broken contacts, and termination separation.

Connectors

A device consisting of a plug and a receptacle that provides a disconnect capability between the various components in an electrical circuit is classified under the general heading of connector. The plug or receptacle is the termination of the internal circuit leads. The connection made between the connector and the conductor itself is made by several different methods: crimping, soldering, welding, and the clamping action of mechanical closures. The type of connector depends on the style of the coupling system. Some of the common connector types are radio frequency, cylindrical multipin, rectangular, and printed wiring.

Connector failure problems may be lumped into three basic categories: mechanical parameter deviation, electrical parameter deviation, and mechanical damage. It should be noted that catastrophic opens and shorts are worst-case conditions of certain electrical parameter deviations. These failures may be the result of several different failure mechanisms. The prevelant failure mode for all connectors is an electrical parameter deviation (open condition) generally caused by contamination interfering with normal operation. Corrosion is another failure mechanism resulting in an open circuit: the oxides formed may tend to act as an insulator. Even gold plated contacts have corrosion problems: the base metal may diffuse through the gold and form an oxide on the surface. Mechanical damage is often the result of improper installation techniques. Wear factor is also a major problem. With hard gold you can expect mating and demating cycles of 200 or more. With tin plating or solder coating, the cycles may drop to 50 or more. This can be a problem when using high density connectors. Other common failure modes are creep or relaxation of the materials in the connection and overheating of the termination by the flow of current.

Coolant Hose

A coolant hose failure often results in the shutdown of a whole system which, in many cases, could have been avoided by routine inspection and replacement. Most equipment owners have established maintenance schedules that include the cooling system. By recognizing the signs of coolant hose failures and eliminating their causes, equipment downtime can be reduced.

Coolant hose failures may be attributed to five major failure mechanisms. Excessive heat, one of the more prevalent failure mechanisms, causes hardening or cracking of the hose cover. Hose "overcure" due to excessive internal or external heat will result in the hose becoming stiff and failing. Weathering and cracking can result from pollution in the environment around the hose; ozone especially has an adverse effect. Large irregular cracks in the hose cover without hardening are caused by vibration. To correct vibration problems, use a flex or humped hose or

dampen the vibration source. Coolant deterioration will cause the interior of the hose to crack and flake off and enter the coolant. These particles can clog the cooling system and cause a failure. The final failure mechanism is contamination of the hose. This occurs primarily when oil or grease soaks the hose, causing it to become soft or spongy. An oil-softened hose can collapse under sudden application of vacuum as in sudden acceleration. To correct this problem, eliminate the source of the oil (may be external or internal) and replace the hose.

Electron Tubes

Electron tubes are devices sealed in a gas-tight envelope or "tube" using the motion of electrons through a gas or vacuum for the desired effect. The first class of electron tubes is the vacuum tube, where a vacuum or a near-vacuum is employed. The second class is gas tubes, where the electrons impact atoms of the gas, which then ionize. Many electron tubes have had extensive military use, and failure rates are available in MIL-HDBK-217C.

Four primary modes are associated with electron tubes: deterioration or destruction of the seal, wearout of electron emission surfaces, evolution of gas, and contaminated or damaged emission surfaces resulting in increased electron emission. The failure mechanism most likely to be directly or indirectly responsible for all four failure modes is excessive heat. Both heat from the environment around the tube and heat generated within the tube create this adverse effect. Internal heat rise is due to one of two sources: the current flow from one element of the tube to another element, and power used to raise the electron-emitting cathode to operating temperature.

Fuses

The basic function of a fuse is to protect electrical circuits. When the current flow through the circuit exceeds the rated capacity of the fuse, the circuit is opened by the fuze element. Fuses provide safety against overload conditions which could result in either damage to the electrical system or a fire.

Fuses have two principal failure modes: open, and failure to open. Any premature interruption of the current flow such as a mechanical breaking of the fuse element would be classified as an open. A failure to open is when current flow levels exceed the fuse rating and the fuse element does not open the circuit. Failure to open is most commonly caused by electrically conductive material shorting the fuse terminals together. The principle failure mechanism is contamination including corrosive products. The source of the contaminants is dependent on the type: conductive and nonconductive. The conductive contaminant can come from solder balls or metal flashings and is usually detectable by x-ray screening. However, the nonconductive material, which can cause failure to open as well as open, is difficult to detect. The source of nonconductive contaminants is sometimes the fuse case or body.

Slow blow fuses are treated a little differently. Slow blow fuses are used when a high in-rush of current is desired to initially start a system and after initial start-up, to maintain the system at a lower current level. If the fuse blows too fast the system will not start or energize. If the fuse blows too slow, damage may occur to the system. Therefore, the most prevalent failure mode of slow blow fuses is the delay time.

Gaskets and Seals

Fluid seals are devices used to effect separation of gaseous or liquid environments at points of structural transition and at movable component interfaces. Seals used in applications where the involved surfaces do have relative motion are commonly called gaskets. An example of structural transition seal is the gasket used in the internal combustion engine between three distinctly separate environments, ambient air, cooling fluid, and combustible gases. An example of a seal for a movable component interface is the gland seal around the shaft of a rotary pump, separating the fluid being pumped from the ambient surroundings. This type of seal is commonly known as a dynamic seal and is used to effectively separate the various environments at movable interfaces where there may be reciprocating longitudinal movement as well as rotary motion.

The most common failure mode for fluid sealing devices is leakage, classified into three basic types: (1) permeation, (2) molecular, and (3) viscous flow. Permeation, as the name implies, is a capillary flow directly through the material. This is primarily because of the degree of porosity of the batch material from which the seal was fabricated. Molecular flow is a similar phenomenon, but it occurs at the interface surfaces and is caused by a finite unoccupied space between the two surfaces of the interface. Molecular flow is proportional to the pressure differential between the separated environments. Viscous flow also occurs on the interface surfaces and is encountered when the minimum cross-sectional area of the leakage path becomes large in comparison to the mean free path requirement for gas flow. Viscous flow leakage rate is proportional to the difference between the square of the internal pressure and the square of the external pressure.

In addition to leakage (limited loss of contained fluid), fluid sealing devices fail by rupture because of inadequate back-up rings or excessive pressures and the introduction of corrosion products or other contaminants. Rupture may be caused either by excessive pressure differentials applied to the sealing device or by shearing mechanical forces applied in an unforeseen rotational mode or as an excessive transverse force. Corrosion products and other contaminants may be caused by normally anticipated environmental considerations, or they may be the result of galvanic corrosion and/or contaminants in inadequately filtered fluid.

Gyroscope

A gyroscope is a device developed to detect angular motion with respect to inertial or Newtonian space. Each design is somewhat unique; however, the usual construction is a spinning wheel with one or two degrees of freedom. A gyroscope normally consists of six functional components: wheel, spin bearings, spin motor, gimbel, pickoff and torquer. The primary source of failures are the spin bearings. The normal life of each gyroscope is dependent on the environment it is used in and the conditions it operates under. The prevalent failure mode of gyros using ball bearings is deterioration of the lubricant or running surface due to contamination.

Gas bearings are excellent for continuous operation because of no wear under run conditions. The major failure mechanism occurs during starting and stopping. Grease bearings offer a greater tolerance to contamination and potentially much longer life. Drift instability is also a problem since a very small amount of creep in the gyro float material can cause a drift equivalent to a nautical mile. Material creep is caused by instability due to time and temperature cycling effects.

IC Sockets

There are two basic types of contacts in IC sockets: screw machined, closedentry sleeves with screw machined or stamped-and-rolled four-leaf contact inserts; or one-piece stamped and formed contacts with single or dual-leaf contacts. Either socket type is available with solder tail on wire-wrapable terminations.

Sockets with stamped contacts come in two configurations. In one, the contacts mate with the broad sides of the leads. In the others, the contact mates with the side and are called side-wipe or face-grip. The merits of these two approaches have been debated at great length.

Zero insertion force connectors have a sliding mechanism that provides effortless insertion and withdrawal of ICs when the sockets are in the open position but locks them securely in place when the mechanism is closed. Zero insertion force sockets are expensive but not compared to a 40 pin IC with a broken lead. Therefore, these sockets are mainly used in "high pin" ICs.

For contact materials, beryllium copper when used for high reliability application is an excellent choice. It retains good spring qualities, although it requires plating because of a tendency to form surface oxides. Phosphor bronze provides excellent spring qualities, adequate conductivity, and generally gives the best combination of economy and reliability. It also usually requires plating with solder lead contacts in order to aid solderability.

Socket bodies are commonly made of thermoplastic materials like glass nylon, glass polyesters and polycarbonates. Thermosets like DAP and phenolics are also used. They provide excellent dimensional stability and heat resistance but are generally more expensive.

One of the major failure modes for sockets is high resistive connections. If the application is in a high contamination area there is the risk of oxidation forming on the contacts or of the accumulation of dust or dirt particles. This condition creates a high resistive connection which may result in a false indication when using sensitive circuitry.

Intermittents are even a larger problem due to problems of location of the intermittents. This is especially difficult in digital systems where there are either high or low logic levels.

The contact must maintain its spring qualities after several removal and insertion cycles. The amount of pressure exerted on the IC lead must be adequate to break through any oxidation which may have formed.

Sufficient caution must be taken during soldering to insure that solder does not enter the barrel of the IC socket, preventing proper installation of the IC.

The following is a listing of failure modes for IC sockets:

- Increase in contact resistance with repeated insertion because of fatigue and deformation of spring material in contact fingers
- 2) Damage to contact and pin plating with repeated insertion and exposure of base metal to corrosive atmosphere
- 3) Corrosion of contact and pin surfaces because of porous plating, plating that is too thin, diffusion of base metal into plating, scratched plating, etc.

- 4) Insulation resistance failure of plastic socket housing because of water absorption or change of mechanical properties of housing at high temperatures
- 5) Electrochemical reaction between socket contact and IC pin
- 6) Poor contact resistance caused by surface films on socket contacts and IC pins

Motors

Motors can be classified into two basic types, ac motors and dc motors. In direct-current motors, speed adjustment is inexpensive and easily obtained; therefore, a wide variety of industrial applications use DC motors. Alternating-current type motors are frequently used in aerospace applications. Overheating causing premature motor failure can be the result of the selection of too small a motor for the given application or of a unit unsatisfactory for the given environment. Therefore, it is important to implement a proper selection and application program for reliable motor operation.

The principal failure modes associated with motors are related to the lubrication of the bearings or the commutation of the brushes. Bearing failure can be caused by various failure mechanisms, of which the most common are: inadequate lubrication due to migration or evaporation or severe operating conditions, brinnelling (plastic deformation of the raceways), fretting corrosion, raceway contamination, and spalling of raceways. Bearings have proven to be the life-limiting items in motors. Most dc motors have the additional failure modes associated with brushes (i.e., fracture, rapid brush wear due to high altitudes, and bearing failures due to contamination from brush wear) and in general are more prone to failure than ac motors.

Printed Circuit Boards

There exists a variety of printed circuit boards commercially available. The choice of interconnection board depends on many different factors. Required packaging density, desired delivery time, cost limitations, usage environment and

size of production run are all factors which can be used to determine the optimal type of interconnection board for a particular application. Circuit board reliability is also an important consideration, and this section includes failure modes and mechanisms for double sided, multilayer, multiwire and wirewrap interconnection boards.

The plated through hole is used in double sided, multilayer and multiwire printed circuit boards to connect component leads to board circuitry. The plated through hole is the largest contributor to circuit board failures for these types of boards. Problems arise because of the differences in thermal expansion of the epoxy glass base material and the copper plating. The epoxy glass and the copper expand and contract at different rates during thermal cycling. This results in axial strains on the plated through hole barrel wall, weakening the mechanical properties of the copper plating and eventually leading to open circuits. In the case where the ductility of the copper plating is already poor, this process is accelerated. Additionally, poor drilling or excessive acid etching during the plated through hole cleaning process can lead to imperfections in the barrel wall. These imperfections will amplify the level of axial strain in the plated through hole and contribute to possible open circuits.

Multilayer boards, as compared to double-sided boards have additional layers of circuitry separated by epoxy glass laminations. This allows for higher packaging density but also creates additional plated through hole problems. Electrical connections to the plated through hole can be made at a number of different layers in the circuit board. This adds to the number of areas which are affected by strains related to thermal cycling. At each layer where a copper run must connect to the plated through hole, a shearing force is applied to the copper run - plated through hole interface, resulting in possible open circuits.

The multiwire type of interconnection board is unique because insulated wire is laid down on the epoxy glass as an alternate to the copper runs used in double-sided and multilayer printed circuit boards. This results in high packaging density because the insulated wires can be crossed on a single level of circuitry. There are several advantages in this type of system but there are also different failure modes

which must be considered. Problem areas are the points of wire crossover and the wire to plated through hole connection. Under extreme environmental conditions, the wire insulation and the wire deform at a point of wire crossover and potentially cause short circuit. The wire to plated through hole can be the source of an open circuit if exposed to vibration and thermal cycling.

One advantage of wirewrap interconnection boards is the absence of plated through holes and the associated problems. However, several failure modes do exist. Insufficient tension in the wire can result in a poor connection between the wire and the wirewrap post. This occurs particularly when applied to a high vibration environment. Additionally, caution must be observed concerning wire insulation cold flow; adjacent wires or contact with a part can result in short circuits due to cold flow. Some materials which exhibit cold flow are teflon, polyvinyl chloride, etc.

Pumps

Hydraulic Pump

Nearly all hydraulic pumps work in rotary fashion. As a pump is rotated, it develops a partial vacuum on the inlet (suction) side, permitting fluid under atmospheric pressure in the reservoir to flow into the pump inlet. Then the pump ejects this fluid, usually at a higher atmospheric pressure. It is worth noting that a pump does not create pressure; it merely moves fluid, causing the flow. Pressure is created by the load on the fluid; if no load exsits, the fluid will have very little pressure. As the load is placed on the fluid, the pressure at the outlet side of the pump increases to a value that is normally indicated as the pump maximum.

Failure modes for hydraulic pumps include:

- 1) Bearing or bushing failure
- 2) Incorrect fluid used, causing excessive wear
- 3) Seal deterioration
- 4) Cavitation causing pump internal part failures

Pneumatic Pumps (Compressors)

An air compressor delivering air to a pneumatic system performs the same job as a hydraulic pump. The main substantive difference between pump and compressor is that the fluid delivered by the compressor-air is compressed and under pressure at the time it is delivered, even if there is no load on the system. The only other substantive difference between the two is that most hydraulic systems are powered by a single pump that is actually part of the system, whereas the hose of the pneumatic systems is often powered by a single compressor, which is almost a "utility" in the plant, like water or electric service.

Failure modes for pneumatic pumps (compressors) include:

- 1) Bearing or bushing failure
- 2) Seal deterioration and leakage
- Foreign material entering pump, causing damage or excessive wear to internal parts
- 4) Check valve leakage (when valves are integral with the pump)

Quick Disconnect Couplings

The malfunction modes of quick disconnect couplings are:

- 1) Failure to open or remain open
- 2) Failure to close or remain closed, including leakage, while uncoupled
- 3) External leakage while coupled

The possible causes for mode 1 include deformation or failure of the actuation plunger of connectors and binding of the movable engaging clamp ring. The possible causes for mode 2 include binding or cocking of the moving assembly of the connectors and failure or permanent deformation of the plunger return spring. Possible causes for mode 3 include leakage of the sleeve O-ring and leakage at the lip seal.

Relays

A relay is basically a remotely controlled, electrically operated switch which contains two or more contacts arranged so as to control external circuits. This broad definition applies to all relays regardless of type and internal construction. Most relay types, with the exception of simple thermal time delay and reed types, are complex electromechanical devices. Experience with these devices has indicated that, because of imperfections in materials and workmanship, a relay cannot be satisfactorily specified by contact rating alone. Physical considerations force us to recognize such compromising characteristics built into a relay as operate and release time, temperature effects on pickup and dropout voltages, dielectric breakdown, contact resistance, and insulation resistance. These characteristics are not simply design controlled but are directly affected by the materials employed and the care with which the relay is assembled. The factors of design, materials, and workmanship are the ones usually associated with relay failure.

Part level failure problems associated with relays may be lumped under four basic categories:

- 1) Failure of contacts to make or break
- 2) Short
- 3) Electrical parameter deviation
- 4) Mechanical anomaly

These categories are used for both latching and nonlatching type relays. For this discussion, relays have been grouped into two categories according to their basic internal construction-armature and reed types.

Armature Relays

The relay style most often used in high reliability application (and considered here) is the balanced armature type because of its demonstrated ability to withstand mechanical shock and vibration. In these relays the armature is pivoted at

its center of mass so as to place it in equilibrium with the static and dynamic forces which act upon it during operation. The moving contacts are either mounted on the armature or activated by movement of the armature.

Almost all armature type relays use copper magnet wire in the coil windings. In such copper windings the coil resistance is directly proportional to the temperature of the windings. The ampere-turns required for the coil to actuate the armature is, therefore, proportional to temperature since the coil resistance varies with coil temperature. To maintain the required ampere-turns, the pickup and dropout voltages will vary over the application temperature range.

One of the most crucial and troublesome areas in armature relay reliability is that associated with the contacts. Many of the problem areas result from the users' lack of understanding of the parameters which affect contact performance. As a consequence, contacts are operated under a wide spectrum of load conditions and a multiplicity of performance criteria which, when reviewed singularly or in combination, are inconsistent with the design parameters of the contacts.

There is a wealth of information available on contact theory and the various materials used in obtaining specific contact characteristics. The user of relays in high reliability applications should be thoroughly familiar with the information since reliability is frequently achieved through carefully limiting certain service applications.

Contamination is also a major concern in high reliability relays because it is a prime contributor to relay failures. Contamination is predominantely introduced during the assembly of the relay. The contamination level can be reduced by careful selection of materials which are used for fabrication of the end product. The user should pay particular attention to the materials used for spacers, washers, insulators, and coil insulation, as well as plating requirements, before specifying a particular manufacturer's relay for his applications. These areas are considered critical to the reduction and control of contamination.

The above discussion has served to define a few of the characteristics associated with armature relays. These and other limitations can be described as specification limits for manufacturers and designers. Deviations from the limitations can lead to equipment failure.

Reed Relays

Reed relays are made from one or more reed capsule switches inside a common actuating coil. In those cases where the reed capsule switch is used in conjunction with a coil, it is generally classified as a relay; and in those cases where the reed capsule switch is used in conjunction with permanent magnet actuation, it is classified as a magnetic switch.

A basic magnetic reed switch consists of a pair of low reluctance ferromagnetic, slender flattened reeds, hermetically sealed into a glass tube with a controlled atmosphere, arranged in cantilever fashion so that the ends align and overlap with a small air gap in between. The overlapping ends assure opposite polarity when brought into the influence of a magnetic field. When the magnetic flux density is sufficient, the attraction forces of the opposing magnetic poles overcome the reed stiffness, causing them to flex toward each other and make contact. The restoring force provided by the elasticity of the reeds returns the reeds to their original position when the magnetic field is removed. Reed capsule switches, when used within their rated limits, generally have contact life ratings in the one to one hundred million cycle range, depending on contact voltage and current loads used.

The reed switch is inherently a low current, low voltage device. Its contact areas are small and contact pressures are low because the reeds become magnetically saturated; therefore, diditional contact force cannot be developed by increasing the applied magnetic flux. These factors limit the continuous current rating of the switch. The interruption rating of the switch is limited by the gap between fully open contacts and by the restoring force provided by the elasticity of

the reeds. Low contact pressures and small contact gap between fully open contacts limit the reed capsule switch use in severe vibration and shock environments.

The unpredictable random occurrence of contact sticking inherent in these switches is caused by tiny magnetic wear fragments accumulated at, and sometimes binding, the contact gap. Arcing caused by dc loads between the contacts causes metal transfer, resulting in spike and crater formation which sometimes results in contact sticking due to friction between the spike and crater surfaces. For these reasons, application should be limited to those uses where an occasional contact miss is not considered a catastrophic event and those uses where voltage and current loading of the switch contacts minimizes spike and crater formation. Careful handling of the switch is a mandatory requirement. The switch contact members extend beyond each end of the glass capsule and are used as switch terminals. Bending, cutting, or applying excessive heat to the switch leads during soldering and installation changes the switch operating sensitivity. Operating one reed switch adjacent to another or in a stray magnetic field can also change its sensitivity. Magnetic shielding around reed relays is relatively ineffective in reducing the effects of uniform stray magnetic fields. Reed relays are inherently more sensitive to stray magnetic fields by one or two orders of magnitude than any other type of sealed relay in common use today. Stray magnetic fields in the order of 5 to 10 gauss have been known to cause reed relays to malfunction.

In those special applications where usage of reed switch capsules occurs, the above factors should be carefully reviewed and considered with respect to each application prior to usage.

Solder Connections

One of the most prevalent modes of failure for solder connections is the cracking of the connection due to thermal fatigue. In many instances, it is very difficult to distinguish between solder cracking as a result of thermal fatigue and

solder cracking because of poor workmanship (cold solder joints). But there are differences and they become apparent upon very close investigation. Thermal fatigue cracks will predictably occur on sequentially manufactured items and will also propagate with storage time. Solder cracks due to poor workmanship will appear randomly on sequentially produced items. These failures can be reduced by applying and controlling appropriate design criteria. The following list of criteria is provided as a guide to minimize solder connection problems:

- 1) Use only silicone or polyurethane based conformal coatings; the coatings should be of minimum thickness.
- 2) Avoid gold-plated boards; use solder-plated or solder-coated boards.
- 3) Do not use rigid encapsulating systems to secure and/or protect connected parts on printed wiring boards.
- 4) Resilient spacers, when used, should be of minimum thickness between the solder connected part and printed wiring board.
- Do not hard mount parts to printed boards with mechanical fasteners unless leads are parallel to the board and of sufficient length as to provide strain relief. Also, do not hard mount parts by using minimum lead length inserted through feed-through holes.
- 6) Use terminals only when necessary and then only use terminals designed to be used on printed wiring boards.

Switches

The most consistently documented failure modes for switches are opens and shorts. The mechanism most often responsible is contamination both of the particulate and oxide nature. Particulate material in the form of solder balls or loose metal flashings can produce varied conductive paths or shorts and switch lockup due to wedging or jamming. Nonconductive particulate contamination could result in contact interference or opens as well as switch lockup. Corrosion of the contact surface due to the introduction of external sources such as polluted or heavy industrial environment, moisture and salt, body oils, solder resin, and wire lubricants also can cause high contact resistance and opens. Successful deterrents to this corrosion include: using corrosive resistive metals (gold, platinum, and palladium) and their alloys, using hermetically sealed switches, stringent control of the cleanliness of the package.

Switch screening inspections and tests are recommended to discover failures before actual part implementation. MIL-STD-202 has many effective tests ranging from temperature cycling to hermeticity and radiographic inspection.

Valves

Valves are used to control the flow of fluids, either liquids or gases, with respect to amount and direction. Industry employs many varieties of valves, such as gate, glove, poppet, plug, and needle valves, plus specialized varieties like check, metering, and relief valves. A common feature of all these valves is that they contain a solid movable member (gate, disk, poppet face, needle, or plug) that impinges on, or into, an orifice in such a manner as to create a fluid-tight separation between the entry and outflow sections of the valve. The contacting surface of this orifice, i.e., valve seat, is normally of an elastomeric material. Where this is not true, the contacting surface of the movable member is deformable or elastomeric in nature or the seat is of a deformable material and the movable member is hard.

The most prolific problem or failure mode detected and described for the valves is leakage. Deterioration of the contacting surfaces, whether due to wear, damage during installation, chemical attack, misalignment, etc., will result in imperfect sealing resulting in internal leakage. All valves, with the exception of relief and check valves, are actuated by an external mechanical force that is transferred to the movable member by a stem or riser. This actuating mechanism is subject to failure by seizure as the result of corrosion, contamination or failure. The required opening into the valve body for entry of the operating stem is an additional source of leakage, due to inadequate design and/or packing. As the valve body is generally formed from a casting, valves are subject to all of the hydrostatic problems associated with castings such as porosity and fracture from mechanical damage or pressure stress fracture due to inadequate section thickness.

Supports for valves and their associated piping are fabricated from flatbar, channel, or angle configurations. These supports should be installed in such a manner that they do not impose undue stresses on the valve piping. Valve actuating media, such as a handwheel, crank or bar should be unhindered by support

installation, permitting a complete clearance radius. When a system is subjected to stress imposed by high temperature and pressure, the supports and hangers should be designed to "walk" with the system, imposing minimal loading and maintaining support integrity.

Primary consideration in the selection of valves includes knowledge of the physical property of materials from which the valve is manufactured in order to assure compatibility with: (1) applicable fluids, (2) operating temperatures, and (3) pressure limits. The function the valve must perform and its dimensional limitations are also important considerations. Life and wear factors must be taken into account as well as maintainability. The valve should be designed to facilitate replacement of gaskets, seals and seat. The applicable limits that are the result of design considerations should be delineated at the design review that is conducted at time of first approval and should be confirmed by proof testing. Furthermore, these limits should be reflected in resulting specification and design handbooks as application notes in order that the system design does not inadvertently contribute to premature failure of the finished system.

DORMANT FAILURE MODES AND MECHANISMS

Bearings

The primary dormant failure mechanism is inadequate lubrication. Some of the common causes of this problem are: evaporation loss, migration loss, and contamination of the lubricant. To eliminate or minimize these failure modes use an oil or grease with a lower evaporation rate or a sealed motor. Periodic rotation every six months will reduce the problem of migration.

Connectors, General

Improper cleaning of connector sockets or pins prior to plating results in plating flaking on subsequent mating/demating. This results in circuit resistance increases or possible short circuits.

Clutches

Drying out of the clutch fibers lowers the required frictional coefficient and results in slippage. Conversely, if clutch faces are left in compression, the clutch materials tend to equalize out any surface roughness, but this causes interlocking of the fibers from each face and sticking. This problem can be overcome by exercising the clutch at least once each year so that the plate fibers are realigned.

Gyros

Gyro drift is the primary aging concern and is usually caused by molecular metallic interchange of the spin bearing detail parts. This phenomenon is similar to cold welding and results in excessive bearing friction that produces drift. The molecular interchange at points of metallic contact is minimized by maintaining a constant temperature on the gyros. Periodic operation at 6 to 12 month intervals is essential in preventing migration of the lubricant away from the wear path and subsequently prevents metal to metal contact.

Magnetrons

The filaments tend to become gaseous unless the unit is operated periodically. The outgassing is a result of time-oriented liberation of gas molecules that have been absorbed on the walls of the magnetron. When enough gas molecules have been generated, activation of the magnetron imparts high velocities to these molecules; they strike the filament and possibly cause shorting.

DC Motors

Brush-type motors are prone to cold welding of the brushes to the armature. The cold welding is caused by brush pressure and the galvanic coupling of the two materials in contact. Periodic operation of this type of motor is recommended.

Relays, Latching

The use of anodic materials such as tin, copper or silver as contact materials have resulted in cold welding or highly resistive contacts after sustained periods of dormancy/storage. The use of more cathodic materials, such as gold as the contact material, overcomes these problems.

Relays, Nonlatching

The same comments that were used for Relays, Latching also apply here. In addition, if the nonlatching relay is a miniature relay, e.g., TO-5 can package, an additional failure mechanism is possible. Cold welding of the relay armature to the backstop has occurred and was caused by plating incompatibility. If the activating coil voltage is in the low range, this age-oriented cold weld is more readily exposed, e.g., no transfer.

Seals

Inherent porosity tends to let seals dry out and become semi-brittle unless kept wetted. The resultant embrittlement creates leakage paths as a function of

osmosis. Ozone (caused by electric motors or electric welding) concentrations also tend to accelerate seal aging by breaking down the seal fibers. All system containing seals should be activated at least once a year to assure rewetting of seals.

Switches, Sensitive

The same comments that apply to Relays, Latching also apply here except that the consequences may be more severe for switches. The wiping action of the contacts is about 50% less than for relays. Thus, resistive oxides or contaminants are less likely to be scrubbed from the contacts.

Transformer

Coil shorting can be caused by improper removal of cleaning agents that erode the dielectric off the wire windings or by cold flow of the insulation material covering the wire windings.

PART FAILURE MODE DISTRIBUTION

The failure mode information presented in this section is limited to those modes considered to have a significant frequency of occurrence. Failure modes resulting from workmanship, inadequate inspection, screening and misapplication have not been included.

PART FAILURE MODE DISTRIBUTION

		FREQUENCY OF
PART TYPE	FAILURE MODE	OCCURRENCE IN PERCENT
ACCELEROMETERS		
ACCEDEROWETERS	BINDING	33
	DRIFT	27
	OPEN	23
	UNSTABLE	17
	UNSTABLE	••
BATTERIES		
Lithium-Sulfer Dioxide		
	INTERNAL SHORT	21
	INTERNAL OPEN	7
	LARGE STARTUP DEL	AY 50
	LOW ENERGY CAPAC	ITY 2
	HERMETICITY	20
TO A DINCE		
BEARINGS	WEAR	73
	BINDING	20
	SCORED	7
	SCORED	•
CIRCUIT BREAKERS		
	SHORT	38
	OPEN	38
	UNSTABLE	19
	ARCING	5
CONTROPOR		
CONNECTORS	OPEN	36
	MECHANICAL DAMAG	
	INTERMITTENT	22
	CONTACT RESISTANC	
	SHORT	,
CYLINDERS, ACTIVATING	LEAKING	52
	WEAR	18
	STRUCTURAL	13
	MECHANICAL DAMAG	
	DRIFT	6
		·
FUSES		75
	SLOW OPEN	• •
	EXCEEDS AMP RATIN	· ·
	ODEMATTIDE (IDEN	1()

PART FAILURE MODE DISTRIBUTION (Cont'd)

		FREQUENCY OF
PART TYPE	FAILURE MODE	OCCURRENCE IN PERCENT
GEAR BOXES		
	LEAKING	40
	MATERIAL FAILURE	35
	BINDING	25
CENEDATORS		
GENERATORS	WEAR	44
	CONTAMINATION	17
	DRIFT	16
	BEARING	13
	ELECTRICAL	10
	ELECTRICAL	10
GYROS		
	DRIFT/UNSTABLE	64
	BINDING	16
	OUT OF TOLERANCE	8
	UNBALANCED	6
	BEARING	4
	RATE ERROR	2
MOTORS		
MOTORS	BRUSH BREAKAGE	32
	OR WEAR	32
	CONTAMINATION/LO	SS 31
	OF LUBRICANT	51
	OPEN/SHORT STATOS	R 14
	COMMUTATOR FAILU	
	OPEN/SHORT ROTOR	
	OF EN SHORT ROTOR	11
PUMPS		
	LEAKING	53
	INTERNAL PART FAIL	_
	IMPROPER OPERATIO	
	WEAR	8
	BEARING FAILURE	6
RELAYS		
	CONTACT RESISTANCE	CE 25
	OPEN	24
	DRIFT	16
	NO TRANSFER	16
	CONTACTS BURNED	7
	MECHANICAL	5
	INTERMITTENT	4
	SHORT	3
	257	

PART FAIL ? MODE DISTRIBUTION (Cont'd)

		FREQUENCY OF
PART TYPE	FAILURE MODE	OCCURRENCE IN PERCENT
SEALS		
	PHYSICAL DAMAGE	54
	LEAKING	39
	DETERIORATION	7
SOLENOIDS		
3321.323	SHORT	52
	BINDING	29
	WEAK SPRING	19
SPRINGS		
	FATIGUE	45
	WEAK	28
	WEAR	23
	DISTORTED	4
SWITCHES		
	MECHANICAL	51
	INTERMITTENT	13
	FAILED TO OPERATE	
•	OPEN	9
	SHORT	9
	DRIFT/UNSTABLE	8
	CONTAMINATION	1
SYNCHROS		
	DRIFT	28
	MECHANICAL	22
	OUTPUT ERROR	22
	INTERMITTENT	17 11
	OPEN	11

NONELECTRONIC PART RELIABILITY DATA

APPENDIX

ADDITIONAL RAC SERVICES

ADDITIONAL RAC SERVICES

Search Services

Retrospective Searches are conducted at a flat fee of \$125 per search. If no references are identified, a \$50 service charge will be made in lieu of the above. For best results, please call or write for assistance in formulating your search question. An extra charge, based on engineering time and costs, will be made for evaluating, extracting or summarizing information from the cited references.

Consulting Services

Consulting Service fees are determined by the costs incurred in the conduct of the designed work, including staff time and overhead, materials and other expenses. Work will be initiated upon receipt of a signed purchase order. We will be pleased to prepare firm cost proposals.

Full Service Participating Plans

Two plans are offered to both government and industry

Participating	Member (PM)	\$1,600
Participating	Associate (PA)	400

Services provided to a Participant in either plan are:

- o Automatic receipt of one (1) copy of each RAC microcircuit and semiconductor device databook issued over twelve months at a savings of \$70.
- Availability of additional copies of each of the above databooks at 20% off list price.
- o Discount on registration fees for RAC sponsored training courses, seminars, workshops, etc.

In addition, the **Participating Member** may access RAC resources as needed without issuing purchase orders. Up to 50 man-hours of professional consultation are authorized.

Blanket Purchase Order

The Blanket Purchase Order option enables you to write a single Purchase Order for a stipulated maximum dollar amount (depending on your needs) and active time duration (a one-year period is suggested), but you pay only for services rendered or documents purchased.

Military Agencies: Blanket Purchase Agreement, DD Form 1155, may be useful for ordering RAC reports and/or services. Please stipulate maximum dollar amount authorized and cutoff date on your order. Also specify services (e.g., publications, search services, etc.) to be provided. Identify vendor as IIT Research Institute (Reliability Analysis Center).

Ordering Information

Place orders or obtain additional information directly from the Reliability Analysis Center. Clearly specify the publications and services desired. Except for blanket purchase orders, prepayment is required. All foreign orders must be accompanied by a check drawn on a U.S. bank. Please make checks payable to IITRI/RAC.

SERVICE FEE SCHEDULE AND ORDERING INFORMATION

JUNE 1981

		0 UND 1901	Pr	rice Per Copy	•
Comp	onant Relia	bility Databooks	Issue Date	Domestie	Foreign
()	MDR-13	Memory/LSI Data	Nov. 1979	\$60.00	\$70.00*
()	MDR-14	Hybrid Circuit Data	Mar. 1980	60.00	70.00*
()	MDR-15	Digital Evaluation and Generic Failure Analysis Data - Vols. I and II	Aug. 1980	60.00	70.00**
()	MDR-16	Linear/Interface Data Complete Set: \$310	Feb. 1981	60.00	70.00**
()	MDR-17	Digital Pailure Rate Data (\$360 non U.S.)	Aug. 1981	60.00	70.00 * *
()	DSR-3	Transistor/Diode Data	Jan. 1980	60.00	70.00
()	NPRD-2	Nonelectronic Parts Reliability Data	Aug. 1981	60.00	70.00*
Equip	ment Datab	ecoles			
()	EERD-1	Electronic Equipment Reliability Data	Oct. 1980	60.00	70.00**
()	EEMD-1	Electronic Equipment Maintainability Data	Oct. 1980	60.00	70.00*
RAC Design Handbook					
()	RDH-376	Reliability Design Handbook	Mar. 1976	36.00	46.00**
Technical Reliability Studies					
()	TRS-1	Microcircuit Screening Effectiveness		36.00	46.00*
()	TRS-2	Search and Retrieval Index to IRPS Proceedings-	-1968 to 1978	24.00	34.00**
()	TRS-3	EOS/ESD Technology Abstracts		36.00	46.00*

24.00

24.00

34.00*

34.00*

*For air mail shipment to points outside North and Central America, add \$10.00 per item
**Por air mail shipment to points outside North and Central America, add \$15.00 per item

Electrical Overstress/Electrostatic Discharge

Electrical Overstress/Electrostatic Discharge

1979 Symposium Proceedings

1980 Symposium Proceedings

Quantity Purchase Discounts - Discounts on multiple copies of a single title ordered at one time) are:

Quantity	Discount	Quantity	Discount		
1-2 3-6 6-9	list 15% off list 20% off list	10-19 20-49 50-99 100 or more	33-1/3% off list 45% off list 60% off list negotiable		
ORDER FORM		Please send me the	Please send me the documents checked above.		
Enclosed find \$		Name/Title			
Send order and check	to:	Organization			
Reliability Analysis Center RADC/RBRAC Griffiss AFB, NY 13441		Address			
		City/State	Zíp		

Phone: 315/330-4151 Autovon: 587-4151

EOS-1

EOS-2

Symposium Proceedings

()

()

Prepayment of orders is required. Please make checks payable to IITRI/RAC. Foreign orders must be accompanied by check drawn on a U.S. bank.

> The Reliability Analysis Center is a DoD Information Analysis Center operated by III Research Institute, Chicago, IL